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Table of Contents.

FLIES, FLEAS AND LICE.[1]

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WHEN a nation is at war, flies, fleas and lice may be expected to increase in numbers, owing to the changed conditions of hygiene and sanitation associated with the movement and concentration of troops, and to the temporary disturbance of the normal life of the population. In past wars, these insects have played an important part in reducing the effective strength of armies by spreading certain epidemic diseases. The importance of this aspect of hygiene and sanitation is fully recognized by the Army Medical Services. It is now a matter of history how the spread of insect-borne diseases was controlled during the world war of 1914-1918, largely by developments in Army hygiene and sanitation. The present conditions in Australia, associated with the nation at war, are new in the life of the Commonwealth. In previous wars we have been far away from the centres of outbreaks of insect-borne diseases. A great responsibility now devolves on the Army Medical Services and the civilian health authorities to prevent epidemics of insect-borne diseases in this country.

Field hygiene and sanitation among armies on active service aim primarily at the prevention of wastage of the fighting strength of units by sickness. Changes in methods of warfare may necessitate modifications of the rules of sanitation laid down in army manuals. Health authorities, in time of war, are faced with unknown difficulties related to hygiene and sanitation arising out of the effects of war on the life of the civilian population.

[1] This article is based on a lecture given to the Army Medical Services, Fourth Military District, at Adelaide, on February 18, 1942.

Flies.

The kinds of flies occurring in houses, huts or camps will depend on the breeding places available in the area. The house fly (*Musca domestica*) will be commonly found in houses, living huts, mess huts and kitchens. The Australian bush fly (*Musca vetustissima*) and "blow flies" will be troublesome under more open-air conditions. In addition, species allied to *Musca*, such as the lesser house fly and the latrine fly, will be found. Little specific information is available about the kinds of flies present in camps in Australia and their habits; it would be a helpful guide to control measures if a survey census could be made of the species of flies present in selected camps. Observations made in several countries show that *Musca domestica* is the dominant species found in houses and living huts; for instance, a census made in Peiping about twelve years ago showed that 98·4% of 384,000 flies examined were of this species. Insanitary conditions, which favour increase in the numbers of house flies, are also favourable to allied species of *Musca*.

The female house fly may lay up to 2,500 eggs in a month, which is the average length of life of the adult fly. The eggs are laid in batches, up to 150 in a batch, in kitchen refuse, in decomposing vegetable matter, in garbage heaps, in latrine trenches, and in other animal excreta, particularly horse manure. The eggs may hatch within two or three days, in hot weather within twenty-four hours; the maggots become fully fed within a week and crawl into a dry place to pupate; the adult fly may emerge from the pupa within four days and commence egg-laying in three days. With temperatures about 30° C. (86° F.), 20° C. (68° F.) and 16° C. (60° F.), the fly can complete its life cycle in about nine, twenty and forty-five days respectively.

When flies visit the filth in their breeding places in order to feed and lay eggs, they may take up disease organisms in the crop and on the hairy pads of their feet. Subsequently, when they crawl over human food, they infect it with their dirty feet and excreta, and also by

the habit the house fly has of regurgitating its food while feeding. In this way they can contaminate food with the typhoid bacillus, dysentery bacilli, cysts of *Entamœba histolytica*, and probably cholera vibrios, from infected fæces and urine, thereby assisting in the spread of typhoid, dysentery and cholera. Here lies the significance of flies in relation to infected human carriers of these diseases.

Control of Flies.

Control of flies means primarily control of their breeding places. In field service camps and in mobile units attention to the following routine rules should be observed.

1. The latrine portion of a camp should be restricted to well-defined areas, so that fly breeding places can be suitably treated.

2. Complete incineration of refuse is desirable. When incineration is impracticable, refuse can be buried in pits and sprayed with kerosene to keep away flies. When the pit is filled in, the soil and top layer of refuse should be treated with creosote or suitable crude oil, to prevent fly maggots from emerging from the refuse. In loose sand fly maggots will make their way to the surface to pupate from a depth of four feet.

3. Trench latrines should have appropriate covers. Small mobile units could carry portable equipment—for instance, an oil drum fitted with a portable lid is a useful piece of sanitary equipment. When latrine trenches are being filled in, creosote should be mixed with the top layer of soil, and this layer should be extended six inches wider than the trench, because fly maggots work out from the side of the trench when they come to the surface to pupate.

4. Urine tubes leading into soakage pits are readily made from sheet iron or petrol tins; the least possible surface of the urinal should be exposed to flies.

5. Sullage water from the cookhouse or washing troughs should be passed through a strainer to remove fat and soap, and led into a soakage pit. If this is not done, the ground becomes fouled and attracts flies.

6. Horse manure should not be buried. In hot, dry weather it will soon dry if spread out in a layer about one inch deep, and flies will not breed in dry manure. When there is much horse manure, it can be close-packed in a heap; the heat of fermentation in the heap may attain 170° F., but maggots of the house fly are killed at 115° F. Some maggots may crawl out and pupate round the heap, but they can be killed by spraying with suitable crude oil.

In base camps and hospitals fly traps are useful. They should be baited with an attractive bait—vinegar and water sweetened with sugar is a suitable mixture. A harmless fly poison can be made with one part of a 40% solution of commercial formaldehyde in 39 parts of water, to which a little milk is added, with sugar to sweeten. The mixture should be placed in a saucer or similar container, with strips of cloth or filter paper leading from it. The flies feed on the poison strips, crawl away and die. A mixture of a 1% solution of sodium arsenite in water, sweetened with molasses or sugar, is a good poison bait for use near latrines or refuse dumps. The solution should be sprayed on strips or balls of hessian or sacks hung in sheltered places where flies congregate. The flies feed on the poison and are killed in large numbers. This bait is a dangerous poison, and should be used only under careful supervision.

"Tanglefoot" fly wires are useful in huts and tents. Any suitable wire is cut into lengths of about 18 inches, with a loop at the end of each piece of wire. The wires are coated with tanglefoot and hung in huts, tents or similar places. The flies are attracted to rest on the wires, particularly in the evening. One wire can catch up to 200 flies; the wires can be cleaned by burning and then recoated with tanglefoot. The tanglefoot is made by heating castor oil in a tin and stirring in resin, in the proportions four pounds of castor oil to nine pounds of resin, until the resin is dissolved. The mixture must not boil. The wires should be coated with a brush while the tanglefoot is hot. If necessary, the amount of resin in the tanglefoot may be adjusted a little according to the weather. In hot weather, if many flies are caught, they may roll down the wire if the tanglefoot is too thin, owing to their own weight. A small piece of tin can be fixed at the end of each wire to catch any run-off.

Fleas.

Fleas live as parasites on mammals and birds; they occur in houses, huts and similar places, particularly in sandy soil, or where floor coverings harvour fleas from domestic animals. The species commonly met with are the house flea (*Pulex irritans*), the dog flea (*Ctenocephalides canis*) and the cat flea (*Ctenocephalides felis*). When domestic rats and mice are present, the Asiatic rat flea (*Xenopsylla cheopis*), the European rat flea (*Ceratophyllus fasciatus*) and the mouse flea (*Leptopsylla segnis*) may be found. In general, each species of flea remains closely associated with its particular host, but may be found temporarily on the other hosts; all the above-mentioned species will occasionally bite man.

The female flea lays its eggs on floor coverings, in the cracks and crevices of floors and burrows where the host lives; the eggs may also be laid on the infested animal, but they soon drop to the ground. The house flea has been recorded as laying 448 eggs in 196 days. The cat and dog flea will lay up to 800 eggs; *Xenopsylla cheopis* lays normally 300 to 400 eggs. When humidity is favourable (70% relative humidity or over) and temperature 11° to 15° C. (51·8° to 59° F.), the eggs hatch in a fortnight; if the temperature is 17° to 23° C. (62·6° to 73·2° F.) they hatch in ten days.

The flea larva is an elongate, whitish maggot with biting mouthparts; it bears several long bristles on its body. It lives in floor coverings, in crevices of floors and burrows inhabited by the host, where it feeds on particles of food and excrement. If food, temperature and humidity are favourable, it becomes full grown in about a week and pupates in a small silken cocoon; when these conditions are unfavourable, it may not become full grown for several months. The adult flea may complete its development within the cocoon and emerge in about a week; if the temperature is too low, or the environment too dry, it may not do this for several months. With favourable humidity, *Xenopsylla cheopis* completes its life cycle in thirteen days at 35° C. (95° F.); it takes nearly a month at 18° C. (64·4° F.) (Mellanby, 1933). Adult fleas can live for long periods in the absence of the host. It is a common experience for travellers to be troubled by fleas in huts which have not been occupied for a long time. The longest life-spans, in days, observed by Bacot, whose work at the Lister Institute did so much to advance our knowledge of the bionomics of fleas, were the following: *Pulex irritans*, 513 (fed), 125 (unfed); *Ceratophyllus fasciatus*, 106 and 95; *Xenopsylla cheopis*, 101 and 38. Unfed *Xenopsylla cheopis* lived on an average for 25 days at a temperature of 55° F. in a humid atmosphere; in dry air at 85° F. the fleas lived for only four days. Recent work on the physiology of fleas has shown that the adult is able to abstract water from its fæces, while they are in the rectum, by means of the rectal glands. Also, it closes its spiracles in dry air and so restricts the loss of water by respiration. These features assist the insects to withstand dryness. The larva is more susceptible to high temperatures and dryness than the adult.

Fleas as Vectors of Plague.

The importance of fleas to man is due to the part played by certain species as vectors of plague. Plague is primarily a disease of rodents. It is thought that the disease originated in burrowing rodents in eastern Asia; infection passed to the black rat (*Rattus rattus*), which, with its attendant fleas, started the spread of plague in man throughout Europe, when it migrated westwards in the fourteenth century. Since that time the black and brown domestic rats have spread over the world. Epidemics of plague in man have occurred from time to time in Europe, Asia and Northern Africa, owing to the close association of rats with the habits of man. It was not, however, until 1898 that the causative organism, *Pasteurella pestis*, was

discovered in rats. Later research demonstrated that the bacilli could be transmitted from rat to rat, and to man, through bites from infected rat fleas, particularly *Xenopsylla cheopis* and *Ceratophyllus fasciatus*. When a flea feeds it pierces the skin of the host with its serrated mandibles, and sucks up blood from the wound. The blood passes along the œsophagus into the mid-intestine. A small, chitinous chamber, the proventriculus, is situated at the junction of the œsophagus with the mid-intestine; its function is to prevent ingested blood from passing back from the mid-intestine into the œsophagus. When a rat flea feeds on a plague-infected rat, it takes in *Pasteurella pestis* with the blood. The bacilli multiply in the mid-intestine of the flea and block the proventriculus. A blocked flea cannot draw blood into its mid-intestine and is therefore in a hungry condition; it wanders about, biting any available host. Eskey (1938) states that the Asiatic rat flea becomes blocked during the period from the ninth to the twenty-sixth day after feeding on an infected rat; blocked fleas may die within a fortnight, but some absorb the organisms causing the blockage and live for several months. When a partly blocked flea is feeding, it not only takes in blood from the host, but also regurgitates infected blood from its mid-intestine into the wound, thereby transmitting the bacilli to other rats or to man. In the case of man, the plague bacilli pass to the lymph glands and the patient may develop bubonic plague; if the bacilli are carried in the blood stream to the lungs, the more serious form of the disease, pneumonic plague, may develop.

The ability of blocked fleas to survive and remain infective is an important consideration in the spread of an epidemic. Bacot and his colleague C. Martin kept blocked fleas (*Xenopsylla cheopis*) alive for fifty days in a temperature of 10° to 15° C. (50° to 59° F.); specimens kept at a temperature of 23° C. (73½ F.) lived for twenty-three days. Bacot kept *Ceratophyllus fasciatus* alive unfed for forty-seven days, and found they were infective at the end of that period. Although it has been shown experimentally that more than one species of rat flea can transmit the bacilli from rat to rat, the Asiatic rat flea, and to a lesser extent the European rat flea, are the important species concerned in the spread of plague to rats and man in Nature. The European rat flea is not so susceptible to infection as the Asiatic species, but it may carry the infection for two or three months; in cooler areas, where the European rat flea is the dominant species associated with *Xenopsylla cheopis*, the period during which cases of plague appear may be prolonged (Eskey, 1938).

The occurrence of plague in man is generally preceded by, or associated with, an epizootic among the rats in the area. As the density of the rat population in an area increases, the disease spreads more readily among the rats, and the chances are greater for infected fleas from dead rats to come into contact with man. Rat epizootics and epidemics of plague are seasonal. This fact is associated with the ability of rat fleas to survive away from the host; for instance, flea larvæ do not survive well in hot, dry weather. However, the effect of weather on the rat and flea population is modified by the temperature and humidity in the places where rats live. Therefore, the incidence of plague in an area is determined by a number of factors, of which climate, prevalence of infected rats, and density of the rat population and of the right kind of flea population are all important. Outbreaks should be rare in communities having a high standard of hygiene.

In the early part of the present century plague was pandemic. An outbreak appeared in Hong-Kong in 1894, and during the next thirty years the disease was recorded in most countries of the Pacific region, including Australia; it also appeared in South Africa and parts of Europe. In the years 1900 to 1909, 1,113 cases were recorded in New South Wales and Queensland, 80 cases in Western Australia, 12 in Victoria, and seven in South Australia; no cases were recorded in Tasmania (Cumpston and McCallum, 1926). Owing to the new knowledge which had been established about the part played by rats and rat fleas in spreading plague, all countries carried out vigorous measures to prevent the entry of rats into ports from ships, and to destroy the rat population in ports and other populated areas. The three common domestic rats—namely, the brown rat (*Rattus norvegicus*), the black rat (*Rattus rattus rattus*) and the Alexandrine rat (*Rattus rattus alexandrinus*)—all occur in Australia. The black rat is known as the ship's rat or house rat; its claws are rather delicate and adapted for climbing; if the ears are turned down over the eyes, they reach over the eyes and extend beyond them; the tail is longer than the body. The Alexandrine rat, also known as the fruit rat, is a race of the black rat; it climbs trees and inhabits roofs and the upper stories of buildings; generally it has a whitish belly. The brown rat inhabits burrows, basements of buildings and sewers; the claws are relatively blunt, being suited for burrowing; compared with the black rat, it has shorter ears, a shorter tail and a shorter nose.

There are many difficulties associated with making a reliable census of the rats in an area and their attendant fleas. Cumpston and McCallum (1926) give detailed information about the number and distribution of plague-infected rats caught in Australia during the period from 1900 to 1925, together with particulars about their attendant fleas. *Xenopsylla cheopis* was the dominant species of rat flea in Queensland, New South Wales and Western Australia; *Leptopsylla segnis* was also abundant; there were relatively few specimens of *Ceratophyllus fasciatus*. In Victoria and Tasmania *Xenopsylla cheopis* was rare, *Leptopsylla segnis* being the common species. *Xenopsylla cheopis* was common on rats in South Australia, also *Ceratophyllus fasciatus*. From observations made recently by my colleague Mr. D. C. Swan, we know that *Xenopsylla cheopis* commonly occurs on rats in the Adelaide area; *Ceratophyllus fasciatus* is also present, but in relatively smaller numbers in the warmer months.

Measures for keeping down rats are now carried out by municipal authorities as a routine practice. It is important to bear in mind that, during an epidemic of plague, particular places frequented by rats should be fumigated, with the object of killing not only the rats, but also the rat fleas.

Fleas as Vectors of Sylvatic Plague.

About 1908 it was found that plague was present amongst ground squirrels, particularly *Citellus beecheyi*, in California. It is considered that the disease was carried from infected town rats to these rodents by rat fleas during the epidemic of plague in San Francisco in 1900. By 1910 surveys had established that ground squirrels were infected in nine counties of the State. According to Eskey and Haas (1939), the disease is now known to occur in nine species of ground squirrels in the United States of America, being distributed through ten of the western States, including California. About fourteen years ago the term "sylvatic plague" was adopted to specify plague in wild rodents. The disease is transmitted from rodent to rodent by certain rodent fleas. Sylvatic plague has now been found in various species of burrowing rodents in populated rural areas and in sparsely populated regions in Asia, Africa and South America; it has not been recorded from Australia. In the south-east of European Russia species of ground squirrels (*Citellus* species) and their relatives the sousliks are reservoirs of the disease in the more populated areas of the steppe; in the sandy country, gerbilles (*Gerbillus meridianus*) appear to be an important reservoir. In Manchuria and Siberia the heavily built burrowing rodents known as marmots are infected.

The disease is widely distributed amongst wild rodents in South Africa (A. Roberts, 1935). As in the case of California, it is considered that the infection spread from rats in plague-infested ports during the epidemic of 1900-1902. From about 1914 onwards the disease was recognized in rodents in the inland country; it eventually appeared in the sandy country of the interior, where the gerbilles (*Tatera* species) are known to be reservoirs of the disease. In South America the disease occurs among certain rodents, including the cavy (*Cavia asperea*), a relative of the guinea-pig (Herms, 1939).

The known animal reservoirs of sylvatic plague are fossorial rodents belonging to the sub-order Simplicidenta. Since the disease is transmitted from rodent to rodent mainly by their attendant fleas, the burrowing, gregarious habits of members of this sub-order favour its establishment and spread in an area.

Epizootics of plague develop from time to time among infected rodents, and man may occasionally contract the disease through a bite from a blocked flea, or by handling diseased rodents. Eskey (1938) states that the plague bacilli, in the blood of an infected rodent, are not numerous until a short period before the rodent dies of the disease. This investigator considers that rodent fleas, which are only temporary visitors to man, are relatively inefficient vectors of sylvatic plague to man. This view is supported by the few human cases of plague contracted from wild rodents by trappers and others during wide-spread rodent epizootics in the western part of the United States of America (Meyer, 1938). Sporadic cases of plague occur in man in widely separated parts of the Union of South Africa. They are related to the occurrence of epizootics of sylvatic plague among certain wild rodents. *Mastomys coucha* is an important rodent reservoir, in addition to *Rattus rattus* and the gerbilles (Davis, 1939). Outbreaks of pneumonic plague in Manchuria in 1910 and 1920 are considered to have originated from the tarbagan or Siberian marmot (*Arctomys bobac*), which is hunted for its fur, and is a natural reservoir of plague in this region. These outbreaks may have led to the speculation that human cases of plague contracted from wild rodents tend more to the pneumonic type than do cases contracted from domestic rats. Eskey (1938) found no support for this view in his experiments with fleas taken from infected rats and wild rodents.

In Russia and the United States of America large-scale destruction of wild rodents, known to be reservoirs of sylvatic plague, is being carried out in order to restrict the spread of the disease. Modern methods include fumigation of the burrows, since fleas may remain infective in abandoned burrows for several months. The absence of records of sylvatic plague in Australia suggests that there may be fundamental differences in the habits of our native burrowing rodents compared with those of other countries. These differences may be related to the degree of gregariousness and distribution of the rodent population and its associated flea fauna in relation to climate. It would appear that the combination of circumstances did not favour the establishment of the disease during the epidemics of plague in Australia earlier in this century.

Control of Fleas.

Rugs and mats in places where dogs and cats live must be kept clean; sandy floors in huts, crevices of floor-boards with the accumulated dirt in houses, huts and out-houses are favourable places for flea larvæ. Floors of kennels and similar places for domestic pets are best made of cement with a removable wooden floor, so that the whole place can be kept thoroughly clean. Floors and walls of rooms or huts infested with fleas should be sprayed with a mixture of half a pound of pyrethrum in one gallon of kerosene, or 25% strength kerosene emulsion, or 5% strength creosote emulsion, or other suitable oil emulsion; half a gallon of spray should be allowed for 1,000 square feet of surface. Flaked naphthalene liberally scattered on the floor of a room infested with fleas, the room being left closed for twenty-four hours, is useful; pyrethrum powder may be employed. Dogs and cats may be dusted with derris or fresh pyrethrum powder, the dust being worked into the coat. Dogs can be washed with a carbolic soap or 2% strength carbolic dip.

With regard to rat fleas, it may be necessary to take measures to destroy rats in places where the fleas may come into contact with man. The fundamental feature of rat control is to prevent these rodents from having access to food, as in makeshift grain stores and waste rubbish. Trapping and laying of poison baits will be effective if a variety of baits are used and the baits are changed frequently. In some circumstances it may be desirable to fumigate particular places inhabited by rats with the object of killing the rats and the rat fleas.

Lice.

The head louse (*Pediculus humanus capitis*) and the body louse (*Pediculus humanus corporis*) are associated with man in every country. They are physiological races of the same species, each race having developed different habits.[1]

The head louse attaches its eggs to the hair of the head, near the scalp, and lives in the hair, although sometimes it may be found on the body. A recent report in England (Mellanby, 1941), based on 60,000 observations, discusses the incidence of head lice on patients admitted to hospitals, particularly those dealing with infectious diseases. The figures for industrial towns show that 50% of children aged from two to four years and girls aged from five to fourteen years were infested with head lice. The infestation among schoolboys was lower, and in adult males it did not exceed 2%. Among women the incidence was never less than 5% to 10%. In four rural communities in the south of England less than 5% of the children were infested. Hospital records obtained in rural areas for evacuee children entering the areas during September, 1939, showed that up to 50% of the children were infested; the incidence agreed closely with the results obtained in the home towns of the children.

The body louse lives in the sheltered environment under clothing next to the body and lays its eggs in the folds and seams of the undergarments. Under normal conditions body lice are found only on destitute persons; but under stress of war, when refugees may be crowded together with little opportunity for washing and changing underclothes, casual spread of lice can take place and favourable conditions for their multiplication may lead to a state of lousiness. Observations amongst British troops in France in 1916 showed that one to ten lice per shirt were commonly found; in some instances from 100 to 700 lice were observed on one shirt. It is recorded for the Second Army in France in 1917 that about 10% (10,000) of the men admitted to casualty clearing stations had inflamed skin conditions due to lice (Buxton, 1939). The female louse may lay up to ten eggs a day, and a total of 300 eggs during her adult life of about a month. The eggs are laid particularly in folds of the underclothing and along the seams of the trousers, being cemented to the fibres of the cloth. The temperature at the surface of the human body is about 30° C. (86° F.) and humidity is favourable. Under these conditions the eggs hatch in from nine to eleven days; the newly hatched lice soon begin to feed and become adult in about nine days; the adults live about a month.

The mouth parts of the louse consist of an eversible tube armed with recurved teeth and fine piercing stylets. The insect anchors itself in the skin by means of the recurved teeth, lacerates the tissues with its stylets and sucks up blood from the wound. An inflamed condition of the skin results from irritation of the wound and from scratching. A fasting louse will take about one gramme of blood at a meal, which is about one-third of its weight; a well-fed louse can extrude 0·24 milligramme of excreta in twenty-four hours.

Pediculus Humanus as Vector of Classical Typhus.

The question of lice infestation took on a new significance when Charles Nicolle and his associates, working at Tunis in 1908, showed that *Pediculus humanus* could transmit the virus of epidemic typhus from man to man. It was this discovery that stimulated the great development of measures for controlling lice in the armies engaged in the World War of 1914-1918.

Classical louse-borne typhus is endemic in many parts of the world. Zinsser (1937) lists eastern Europe, including Russia, the Balkans, parts of the Mediterranean region,

[1] The crab louse (*Phthirus pubis*) principally infests the pubic and axillary regions. It is relatively of little medical importance compared with *Pediculus humanus*; it is not a vector of disease.

South Africa, China and South America. Cases occurred on overcrowded ships during the early period of migration to Australia. The disease was recorded on a few occasions on shore—in Hobart until 1845 and in Melbourne up to 1869—but did not become established (Cumpston and McCallum, 1927).

The causative organism of classical typhus is a species of *Rickettsia* (*Rickettsia prowazeki*), which are minute parasites smaller than bacteria. When a louse sucks blood from a typhus patient in the early days of the fever it becomes infected with the rickettsiæ, which may be found in the stomach and epithelial cells lining the midgut of infected lice. Some of the rickettsiæ are passed out with the excreta of the louse; if infected fæces are scratched into abrasions of the skin the person may develop typhus. Both *Pediculus humanus capitis* and *Pediculus humanus corporis* can transmit the disease, but the latter is more important in this respect. In regions where classical typhus is endemic, epidemics may develop when people are ill nourished and crowded under poor hygienic conditions, favourable for lice infestation; an epidemic soon dies down when the infestation is controlled. A remarkable feature about the part played by lice is the fact that *Pediculus humanus* dies within about a fortnight when it becomes infected with *Rickettsia prowazeki*. Since man is the only known animal reservoir of classical typhus, the question arises, how does *Rickettsia prowazeki* persist during intervals between epidemics, Experiments made by J. Starzyk (1938) showed that, at ordinary temperatures, the rickettsiæ can remain infective in dry louse excreta for fifty-eight days; when dry excreta were kept in a vacuum at 5° C. (41° F.) they remained infective for four months. These observations help us to understand how isolated cases of the disease may arise in an area after an epidemic has died down. It would seem, however, that the disease may be carried on during intervals from one epidemic to another, in areas where classical typhus is endemic, by persons having mild or inapparent symptoms of typhus infection (Biraud and Deutschman, 1936). It is evident that the disease could be introduced into new areas under suitable conditions of distress and lousiness.

Pediculus Humanus as Vector of Murine Typhus.

Until about twenty years ago it was thought that the human louse was the only vector of typhus. About this time much interest was centred in sporadic cases of a mild form of typhus which were being recorded in the United States of America and in Australia and subsequently in other countries. The cases were classified as a form of endemic typhus. The evidence indicated that lice were not related to the occurrence of the disease; in the Adelaide cases (Hone, 1922, 1923) and the Toowoomba cases (Wheatland, 1927) contact with rats and mice was suspected. Maxcy (1927) investigated the sporadic cases of endemic typhus occurring in the south-east of the United States of America and concluded that the disease was in some way related to rats and mice. Three years later Maxcy was able to demonstrate that the causative organism of the disease he was studying was a species of *Rickettsia*, which differed from *Rickettsia prowazeki*, the species causing classical typhus. Dyer and his colleagues (1931, 1932) demonstrated the presence of a virus of the typhus type in fleas collected on wild rats in Baltimore and showed that infected *Xenopsylla cheopis* and *Ceratophyllus fasciatus* could transmit the disease to rats. These observations were supported by the results of investigations in other countries. It is now generally accepted that rats, and possibly other rodents, form the reservoir for the virus of a mild form of endemic typhus in several countries, which has been recorded under various names; it is conveniently referred to as "murine typhus" because of its association with members of the rodent family Muridæ. The species of *Rickettsia* concerned in murine typhus is *Rickettsia mooseri*), which appears to exist in different biological strains. It multiplies in the epithelial cells of the midgut of rat fleas, particularly *Xenopsylla cheopis* and *Ceratophyllus fasciatus*, and the rickettsiæ are numerous in the fæces of infected fleas. Infected rats and their attendant fleas appear to be unharmed by the virus. This suggests that the rodent-flea association with *Rickettsia muricola* is a primitive condition, the rodents being a natural reservoir of the disease.

If flea excreta infected with *Rickettsia muricola* are scratched into abrasions of the skin, the subject may develop murine typhus. Sporadic cases occur as a result of casual infection in this way. Evidence is accumulating, however, to show that restricted epidemics of louse-borne murine typhus may develop under conditions of lousiness. *Rickettsia muricola* multiplies in the epithelial cells of the midgut of *Pediculus humanus*, and the rickettsiæ pass out in the fæces of infected lice. The disease may be transmitted to man if infected louse excreta are scratched into abrasions of the skin. *Pediculus humanus* dies within a fortnight after being infected with *Rickettsia muricola*, which indicates that the association of the rickettsiæ with this insect is not a primitive condition.[1]

The type of typhus endemic in Mexico, known as "tarbadillo", appears to occupy a position between murine typhus and classical typhus. The rat is the natural reservoir of the virus of this disease, which is transmitted from rat to rat by rat fleas. Sporadic cases of tarbadillo occur in man from contact of infected flea excreta with abrasions on the skin. However, it has long been known that a restricted louse-borne epidemic may occur in the community under conditions of lousiness. The causative organism of the disease is different from that of classical typhus; it appears to be a biological strain of *Rickettsia muricola*, which is not harmful to *Pediculus humanus*.

Ragnal and Fournier (1939) give an account of an outbreak of typhus in Shanghai during the period from March to July, 1938, in which there were over 1,000 cases, with a mortality rate of 18%. They conclude that enzootic murine typhus, which occasionally affects man in Shanghai, became epidemic owing to the particular conditions due to overcrowding by refugees, under-nourishment and lice infestation. Lui Wei-tung and Zia (1940) record a case in which nine members of a household of ten, in Peiping, developed murine typhus in March, 1940. These authors consider that the outbreak originated from mice as the reservoir of the disease, being transmitted from mice to man by the mouse flea *Leptopsylla segnis*, and then from man to man by lice. The Australian cases of endemic typhus, resembling those first described by F. S. Hone in 1922, were in general associated with rat-infested places. Although the circumstantial evidence suggests that they were related to rats and mice, neither a reservoir nor a vector of the disease has been detected up to the present.[2]

Murine typhus in various forms has been recorded from such widely separated regions as the Mediterranean area, South Africa, Manchuria, China and North America. Thompson, cited by Buxton (1939), states that about 3,000 cases of murine typhus were recognized in the United States of America in 1937, with a death rate of 5%. Cumming (1938) refers to the increase in the number of cases of murine typhus in rural areas in the south of the United States of America. Out of 1,662 cases recorded in 1936, many were from rural districts and infection was not associated with lice; the observations support the view that rat fleas, particularly *Xenopsylla cheopis*, are important in the transmission of the disease to man.

Pediculus Humanus as Vector of Louse-Borne Relapsing Fever.

Louse-borne relapsing fever has been recorded from parts of eastern Europe, Asia and Africa, where it may occur in restricted epidemics; it appears to be present in South and Central America. In the Pacific region it occurs in China and Indo-China, but has not been recorded from

[1] Two other species of *Rickettsia* have been recorded from *Pediculus humanus*: *Rickettsia quintana*, probably the causative organism of trench fever, and *Rickettsia pediculi*, harmless to man. Both species are harmless to the insect.

[2] E. H. Derrick, D. J. W. Smith and their associates (*Australian Journal of Experimental Biology and Medical Science*, 1940) have recently established that the bandicoot (*Isoodon torosus*) is a natural reservoir for *Rickettsia burneti*, the causative organism of "Q" fever in Queensland, the tick *Hæmaphysalis humerosa* being a vector of the disease to man.

Australia. The causative organism is *Spirochæta recurrentis*, which is found in the blood of relapsing fever patients.[1]

When a louse sucks blood from a relapsing fever patient, spirochætes are taken in with the blood into the stomach of the louse. The organisms appear to undergo some development in the insect, and after a few days they appear in the body cavity of the louse. If a crushed louse is scratched into abrasions of the skin at this stage, the spirochætes may enter into the blood stream and the person may develop relapsing fever. Both head lice and body lice may become infected, and the evidence indicates that the insects are not harmed by the presence of the parasites. R. Kirk (1939) gives an account of three outbreaks of the disease in the Anglo-Egyptian Sudan during the period from 1908 to 1936. The disease is not endemic in the Sudan; in each case the origin of the outbreaks was traced to the entry into the Sudan of infected immigrants from neighbouring countries.

Control of Lice.

The appropriate measures for the control of lice infestation will depend upon the circumstances. Hot baths, change of underclothing and disinfestation of outer clothing should be organized where possible. Effective dressings suitable for treating infestation with head lice irritate the scalp and must be used with caution. Phenol (carbolic), 1 part in 40 parts of water, a 2% solution of lysol, or equal parts of kerosene and olive oil have been recommended. They should be applied to the hair for twenty minutes; afterwards the head is washed in warm water.

Body lice take refuge in the seams and folds of underclothing; seams of trousers are favourite places. Some lice will be found on the outer clothing. Infested clothing may be effectively "deloused" by treatment with steam heat or dry heat. Lice and nits (eggs) are killed by an exposure of five minutes to a temperature of 54° C. (129° F.), and of forty-five minutes at a temperature of 50° C. (121° F.), in moist or dry heat (Buxton, 1940). A steam hut, measuring 11 by 9 feet in area and 7 feet high, fitted with rails and steam radiator pipes, will take a load of 200 blankets or equivalent clothing; steam can be supplied by a vertical steam boiler erected at the side of the hut. It is essential to ensure that the temperature is adequate within the folds of the clothing; steam at ten pound pressure has an initial temperature of 239° F.; steam at 20 pound pressure has a temperature of 258° F. Leather goods are damaged by moist heat. Dry clothing can be exposed in a suitable hot air chamber or hut, but it is essential to ensure that an adequate temperature is maintained in the folds of the clothing. Occasional garments may be treated by ironing along the infested seams.

If lice-infested clothing is stored the lice will die in about two days when the temperature is about 30° C. (86° F.); at ordinary room temperature, 10° to 20° C. (50° to 68° F.) they will die in about a week. Buxton (1940) refers to experiments made by H. S. Leeson, who found that the eggs hatched in five to seven days at a temperature of 35° C. (95° F.); at 30° C. (86° F.) they hatched in nine to eleven days; at 24° C. (75° F.) they hatched in seventeen to twenty-one days. The eggs do not hatch when kept at ordinary room temperatures, but they may remain viable for two or three weeks. In practice, it would seem that one month's storage at temperatures below 20° C. (68° F.) would be effective in killing lice and their eggs on infested clothing.

A suitable repellent smeared on the seams of clothing may afford the wearer temporary protection from lice. "N.C.I." compound, consisting of 96% of napthalene, 2% of creosote and 2% of iodoform, was used as a repellent by troops on the Western front in the war of 1914-1918. Buxton (1940) refers to two formulæ developed by N. J. Crawford-Benson and J. Macleod. The substance is a powder which is rubbed into the seams of the clothing; it is stated that the repellent action of the powder is retained for a week.

[1] Other forms of relapsing fever are known from central West Africa, from countries in the Mediterranean region, and from the warmer parts of North, Central and South America. The species of *Spirochæta* concerned are transmitted to man by ticks.

Bibliography.

C. W. Adey: "Endemic Typhus", Report of the Federal Health Council of Australia, Fourth Session, March, 1930, Appendix II, page 24.

Y. Biraud and S. Deutschman: "Typhus and Typhus-Like Rickettsia Infections", Epidemiological Report of the Health Section of the Secretariat of the League of Nations, 1936, Numbers 7 to 9.

P. A. Buxton: "The Louse", 1939; "The Control of Lice", *British Medical Journal*, Volume II, 1940, page 603.

F. E. Cox: "A Review of Recent Literature on Typhus Fever and Acute Poliomyelitis", Commonwealth of Australia, Quarantine Service, Publication Number 13, 1917.

H. S. Cumming: *"Le typhus exanthématique aux Etats-Unis"*, *Bulletin de l'Office international d'hygiène publique*, Volume XXX, February, 1938, page 296. Abstracted in "Review of Applied Entomology" (B), Volume XXVI, page 116.

J. H. L. Cumpston and F. McCallum: "The History of Plague in Australia, 1900-1925", Commonwealth of Australia, Department of Health, Service Publication Number 32, 1926; "The History of the Intestinal Infections (and Typhus Fever) in Australia, 1788-1923", Commonwealth of Australia, Department of Health, Service Publication Number 36, 1927.

J. Davidson: "Some Practical Methods Adopted for the Control of Flies in the Egyptian Campaign", *Bulletin of Entomological Research*, Volume VIII, 1918, page 297.

D. H. S. Davis: "Some Ecological Methods in Research on Bubonic Plague", *South African Journal of Science*, Volume XXXVI, 1939, page 438.

R. E. Dyer, E. T. Ceder, W. G. Workman, A. Rumreich and L. F. Badger: "Typhus Fever: A Virus of the Typhus Fever Type Derived from Fleas Collected from Wild Rats", *Public Health Reports*, Volume XLVI, Number 7, 1931, page 334.

R. E. Dyer, A. Rumreich and L. F. Badger: "Transmission of Endemic Typhus by Rubbing either Crushed Infected Fleas or Infected Flea Feces into Wounds", *Public Health Reports*, Volume XLVII, Number 3, 1932, page 131.

J. C. S. Elkington: "A Review of Recent Literature and Work on Epidemiology of Plague", Commonwealth of Australia, Department of Health, Service Publication Number 5, Second Edition, 1921.

C. R. Eskey: "Recent Developments in our Knowledge of Plague Transmission", *Public Health Reports*, Volume LIII, Number 2, 1938, page 49; "Fleas as Vectors of Plague", *American Journal of Public Health*, Volume XXVIII, Number 2, 1938, page 1305.

C. R. Eskey and V. H. Haas: "Plague in the Western Part of United States", *Public Health Reports*, Volume LIV, Number 32, 1939, page 1467.

W. B. Herms: "Medical Entomology", Third Edition, 1939.

F. S. Hone: "Cases Resembling Typhus Fever", THE MEDICAL JOURNAL OF AUSTRALIA, Volume I, 1922, pages 1, 22, 83, 199; *ibidem*, Volume I, 1923, pages 435, 449, 459.

R. Kirk: "Epidemiology of Relapsing Fever in Anglo-Egyptian Sudan", *Annals of Tropical Medicine and Parasitology*, Volume XXXII, 1939, page 339.

W. T. Lui and S. H. Zia: "Typhus Rickettsia Isolated from Mice and Mouse Fleas", *Proceedings of the Society for Experimental Biology and Medicine*, Volume XLV, 1940, page 823.

K. F. Maxcy: "An Epidemiological Study of Endemic Typhus (Brill's Disease) in the South East of the United States", *Public Health Reports*, Volume XLI, 1927, page 2967.

K. Mellanby: "The Influence of Temperature and Humidity on the Pupation of *Xenopsylla cheopis*", *Bulletin of Entomological Research*, Volume XXIV, 1933, page 197; "The Incidence of Head Lice in England", *The Medical Officer*, February 1, 1941, page 39.

K. F. Meyer: "The Role of the Infected and the Infective Flea in the Spread of Sylvatic Plague", *American Journal of Public Health*, Volume XXVIII, Number 10, 1938, page 1153.

J. Ragnal and J. Fournier: *"Le typhus exanthématique di Chang-Hai"*, *Bulletin de la Société de Pathologie exotique*, Volume XXXII, 1939, page 636.

A. Roberts: "Mammals Concerned in the Bubonic Plague and Rabies Problem in South Africa", *South African Journal of Science*, Volume XXII, 1935, page 414.

J. Starzyk: *"Vitalité, virulence et pouvoir immunisant de Rickettsia prowazeki, conservés en dehors de l'organisme du pou"*, *Archives de l'Institut Pasteur de Tunis*, 1938, page 263. (Abstract in "Review of Applied Entomology" (B), Volume XXVII, page 60.)

F. T. Wheatland: "A Fever Resembling a Mild Form of Typhus Fever", THE MEDICAL JOURNAL OF AUSTRALIA, Volume I, 1926, page 10.

H. Zinsser: "The Rickettsia Diseases, Varieties, Epidemiology and Geographical Distribution", *American Journal of Hygiene*, Volume XXV, Number 3, 1937, page 430.

HÆMOGLOBIN VALUES IN THE BLOOD OF NEWBORN INFANTS

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As there appear to be no Australian figures for hæmoglobin values in the newborn, it seemed worth while, when the opportunity occurred, to make blood examinations on babies within twelve hours of birth.

During a period of about seven weeks in October and November, 1941, hæmoglobin estimations and red and white cell counts were made on 125 babies at the Women's Hospital, Melbourne. The examinations were carried out during the morning on babies who had been born since midnight. The majority had been born longer than four hours, but a few were examined within two hours of birth. Premature babies were excluded from this series. The weights of the babies at birth ranged from 2,653 grammes (five pounds thirteen and one half ounces) to 4,734 grammes (ten pounds seven ounces), with a mean of 3,499 grammes (seven pounds three and one half ounces). (See histogram, Figure I.)

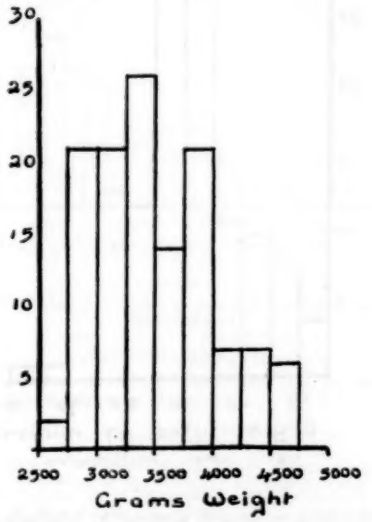

FIGURE I.
Birth weights of infants arranged in groups with intervals of 250 grammes.

The hæmoglobin value was estimated as a percentage by the acid hæmatin method, the result being converted into grammes of hæmoglobin per 100 cubic centimetres of blood. The instrument used was an Adams hæmometer, of 14 gramme standard.[1] The erythrocyte and leucocyte counts were made in the usual manner. The pipettes were shaken by hand, and when the results appeared inconsistent, the counts were repeated. A few results had to be discarded because of clots in the pipette. The samples of blood were obtained by pricking the babies' heels with a straight triangular-edged needle, the heel being first cleansed with ether and in some cases warmed with the hands. The majority of the babies bled freely, but not infrequently more than one prick was required to obtain enough blood for the three estimations and for blood films.

Hæmoglobin.

The range of hæmoglobin content of the blood of the babies was from 115% (16·1 grammes) to 201% (27·2 grammes), with a mean of 159·36% (22·3 grammes) (see Figure II). The standard deviation was 19·75% and the coefficient of variation, 12·39.

The figures obtained from infants during the first day of life by a number of previous workers are in Table I compared with those of the present investigation.

TABLE I.

Name of Investigator.	Number of Estimations.	Range of Hæmoglobin Value (in Grammes of Hæmoglobin per 100 Cubic Centimetres).	Mean.
De Marsh *et alii*[2] ..	25	18·0 to 26·50	22·77
Hicks	125	16·1 to 27·2	22·3
Mackay[3]	62	15·2 to 24·7	20·1
Merritt and Davidson[4]	73	17·0 to 27·5	23·4
Waugh *et alii*[5] ..	52	11·86 to 18·72	15·36
Whitby and Hynes[7] ..	10	17·9 to 22·4	20·8
Williamson[8]	31	—	23·4

These figures have been selected mainly because the methods by which they were obtained appear most reliable. Unless the technique of the tests is similar and the times after birth at which the blood is taken are comparable, marked differences in results may be obtained.

Our results agree with the figures quoted. English figures (Mackay, Whitby and Hynes) are somewhat lower than American (De Marsh, Merritt and Davidson, Williamson). The figures obtained by Waugh *et alii* are low, apparently because they are from cord blood.

De Marsh *et alii* obtained a similar value (15·64 grammes) in cord blood taken at birth.

The hæmoglobin content of the mother's blood had been estimated in almost every case, either by the acid hæmatin method in ante-natal clinics, or, after the birth of the child, by the Tallqvist method. The figures varied considerably, but the majority lay between 70% and 80% (10 and 11 grammes), which we regard as the normal range at term for mothers attending the Women's Hospital.

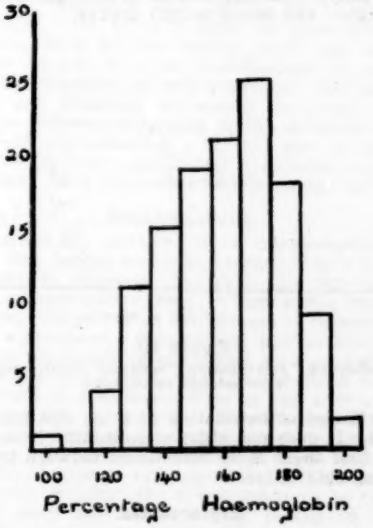

FIGURE II.
Hæmoglobin values in percentages, grouped at intervals of 10%.

The fœtus derives its hæmoglobin from the mother, a full-time baby requiring nearly 400 milligrammes of iron.[10] Even if the mother is anæmic or her store of iron is depleted, it is generally held that the baby takes its full toll. That is, anæmia in the mother has no effect on the hæmoglobin content of the fœtal blood. Gottlieb and Strean,[10] however, have published figures which suggest that a certain degree of anæmia in the mother induces a compensatory polycythæmia in the fœtus. Some of my

results support this, for in the few cases in which anæmia was found in the mother, the infant's hæmoglobin value and erythrocyte count were somewhat higher than the mean of the series (see Table II).

TABLE II.

Mother.	Child.	
Hæmoglobin. (Percentage)	Hæmoglobin. (Percentage)	Red Blood Corpuscles in Millions per Cubic Millimetre.
60	172	7·20
64	185	8·47
50	168	7·53

But there is also the case of a mother with gross hypochromic anæmia (hæmoglobin value 34%). The hæmoglobin value of the infant's blood, 97%, is the lowest recorded at this hospital on the day of birth.

Although no conclusion may be drawn from this one case, it may well be that a moderate anæmia in the mother induces a polycythæmia in the fœtus, but that a severe anæmia in the mother is followed by anæmia in the child.

Hæmoglobin Value in Relation to Birth Weight.

Mackay[4] tabulated the hæmoglobin values she obtained for infants according to the birth weight, in groups of five, six, seven and eight pounds. She found a steady fall of the average hæmoglobin value from 158·5% in the five pound group to 139·8% in the eight pound group. I have drawn up a scatter diagram (Figure III) and worked out a correlation table for the comparison of the hæmoglobin value with the weight at birth. It is to be seen that there is a fairly even distribution of the hæmoglobin values in both higher and lower weight groups.

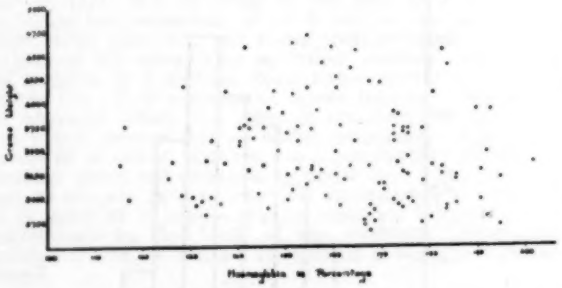

FIGURE III.

Graph showing relationship between birth weight and hæmoglobin percentage.

The coefficient of correlation of these two functions was calculated. It does not differ significantly from zero; this indicates that there is no correlation between birth weight and hæmoglobin value.

Erythrocytes.

The numbers of erythrocytes per cubic millimetre range from 4,650,000 to 9,670,000, with a mean figure of 6,950,000. The standard deviation is 0·95 million and the coefficient of variation is 13·7. Cyanosis was present in the two infants whose erythrocytes numbered more than 9,000,000 per cubic millimetre. The results may be compared with those of other workers in Table III.

These figures show considerable difference in the range, in the minimum and maximum values, and in the average number of red cells per cubic millimetre. Enumeration of the erythrocytes, although a simple procedure, is liable to many errors, and an uneven distribution of the cells in the pipette or counting chamber may readily occur.

TABLE III.

Name of Worker.	Number of Estimations.	Range in Number of Erythrocytes (in Millions per Cubic Millimetre).	Mean.
De Marsh *et alii*[3] ..	25	4·8 to 7·5	6·28
Hicks	123	4·65 to 9·67	6·95
Lippmann[11]	71	—	5·2
Mayers[12]	41	6·3 to 9·6	7·63
Merritt and Davidson[13]	73	4·6 to 6·8	5·95
Whitby and Hynes[7] ..	10	5·9 to 7·69	7·0

Inspection of our results in particular appears to reveal an obviously abnormal preponderance of middle values between 6,500,000 and 7,500,000, as seen in the histogram (Figure IV). This gives the impression that a completely true picture of the erythrocyte count at birth has not been obtained. However, the abnormality is not statistically significant.

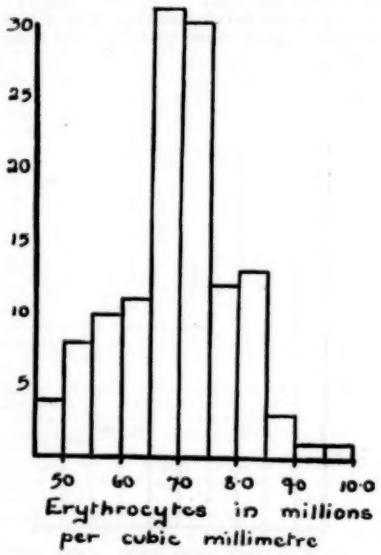

FIGURE IV.

Erythrocyte counts, grouped at intervals of 500,000 per cubic millimetre.

The figures given by De Marsh *et alii* are of blood taken from the heel twenty-four hours after birth. Blood taken within seventy-five minutes of birth averaged 5,990,000 red cells per cubic millimetre; in many cases a remarkable rise in the numbers occurred in the first twenty-four hours, although in 30% a fall was recorded. Cord blood, at birth, averaged only 4,420,000 red cells per cubic millimetre.

Leucocytes.

A wider range may be expected with leucocyte counts. Kato[10] reports an average value of 18,000 per cubic millimetre at birth, rising to over 22,000 at the end of twenty-four hours. Washburn[14] studied on six infants the hourly fluctuations of the number of leucocytes on different days during the period from birth to the age of sixteen weeks. The numbers varied between 4,000 and 23,000 per cubic millimetre. The literature he quotes gives figures within these limits. In the present investigation considerably higher values were obtained, although the average approximates that given by Kato. The minimum value was 9,100 per cubic millimetre, the maximum was 47,350 and the mean was 22,500. The wide range is demonstrated by the histogram (Figure V).

Summary.

1. This study was primarily undertaken to establish values for the hæmoglobin content of the blood of an infant on the day of birth. The values obtained are higher than some of the previously recognized figures, but agree well with those of workers in other parts of the world. Details of the age and weight of the babies and of the method of estimating the hæmoglobin value are given so that a comparison may be made with similar studies.

2. In contradiction of the evidence produced by Mackay that the hæmoglobin value varies inversely with the birth weight, I found no significant relationship between hæmoglobin value and birth weight.

3. It is evident that considerable variation may occur in the numbers of erythrocytes, and it is felt that the difficulty in obtaining accurate counts may account for some of the widely differing figures recorded by the workers quoted above.

4. The high figures obtained for leucocyte count are not consistent with those obtained by previous workers, and further investigation is necessary to substantiate them, with differential leucocyte counts performed as a check on abnormal findings.

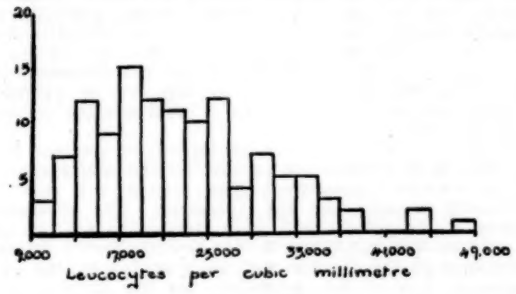

FIGURE V.

Leucocyte counts in groups at intervals of 2,000 per cubic millimetre.

Acknowledgements.

I wish to thank Dr. H. F. Bettinger for his advice and help in the preparation of this paper.

References.

(1) J. D. Hicks: "Standardization of Hæmoglobinometers", THE MEDICAL JOURNAL OF AUSTRALIA, Volume I, 1942, page 486.
(2) Q. B. De Marsh, H. T. Alt, W. F. Windle and D. S. Hillis: "The Effect of Depriving the Infant of its Placental Blood", *The Journal of the American Medical Association*, Volume CXVI, 1941, page 2568.
(3) H. M. M. Mackay: "The Hæmoglobin Level during the First Year of Life: Revised Figures", *Archives of Disease in Childhood*, Volume VIII, 1933, page 221.
(4) H. M. M. Mackay: "Factors Causing Variation in the Hæmoglobin Level with Age in the First Year of Life", *Archives of Disease in Childhood*, Volume VIII, 1933, page 251.
(5) K. K. Merritt and L. T. Davidson: "The Blood during the First Year of Life", *American Journal of Diseases of Children*, Volume XLVI, 1933, page 990.
(6) T. R. Waugh, F. T. Merchant and G. B. Maughan: "Blood Studies on the Newborn", *The American Journal of the Medical Sciences*, Volume CXCVIII, 1939, page 646.
(7) L. E. H. Whitby and M. Hynes: "The Quantitative Estimation of the Fragility of the Red Corpuscles", *The Journal of Pathology and Bacteriology*, Volume XL, 1935, page 219.
(8) C. S. Williamson: "The Influence of Age and Sex on Hemoglobin", *Archives of Internal Medicine*, Volume XVII, 1916, page 505.
(9) L. E. H. Whitby and C. J. C. Britton: "Disorders of the Blood", 1939.
(10) R. Gottlieb and G. J. Strean: "The Prevention of Maternal and Infant Anemia", *Surgery, Gynecology and Obstetrics*, Volume LXVIII, 1939, page 869.
(11) Lippmann: Quoted by Merritt and Davidson, *American Journal of Diseases of Children*, Volume XXVII, 1924, page 473.
(12) L. H. Mayers: "A Study of the Erythrocyte Curve at Various Ages and its Relationship to Hemoglobin Curve", *Archives of Internal Medicine*, Volume XXX, 1922, page 478.
(13) K. Kato: "Leucocytes in Infancy and Childhood", *The Journal of Pediatrics*, Volume VII, 1935, page 7.
(14) A. H. Washburn: "Blood Cells in Healthy Infants", *American Journal of Diseases of Children*, Volume XLVII, 1934, page 993.

CORRECTIVE ASPECTS OF STAMMERING.

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THOUGH the outward manifestations of stammering—the stammerer's grimaces, his stumbling over initial consonants—are familiar, the real factors of the condition are not so evident and are little understood. The majority of medical practitioners may well lack an insight into the peculiar psychic world in which the stammerer lives; it is a world known, as a rule, only to the stammerer himself. It may be mentioned at the outset that elocutionists and others who adopt such corrective measures as vocal and respiratory exercises alone, show a gross misunderstanding of the real condition.

The real factor is a repression of the self, which is altogether mysterious to a non-stammerer; hence his difficulty in appreciating it. Stammering, and the stuttering which is part of it, is a symptom of a wider disorder, a fundamental disunity of the mind. Recurring failures produce an expectation to stammer, with resultant strain and loss of confidence. The stammerer is imbued with the idea that he cannot speak. In the case of intelligent stammerers acutely conscious of their disability, this inhibitory system has widespread ramifications which vitiate the whole personality. The stammerer is acutely susceptible to people and circumstances, and the result is chaos on the expression side. It is in essence a fear complex that has developed from a succession of humiliating failures. This is the source of the trouble, and no progress is possible until fear is cast out. The tension of the stammerer, the anticipation of failure and the dread of it are the outcome of fear. The stammerer knows only too well that he is unable to cope with his environment, that he will fail in a particular set of circumstances, and the greater the desire to do well, the greater is the fear of failure. The stammerer approaches an important interview or a speech in a condition of psychic storm. He is in a fever of apprehension; his mind is dominated by the coming event, and his fear is not whether he will have the qualifications to impress his listeners, but whether he will stammer. He knows that if he did not stammer he would do well. But the subconscious influence—the sum of the stored-up memories of failure—is overpowering. It will not be difficult to imagine how he feels continually frustrated, or how his disability may have disastrous effects on his personality.

Misconceptions.

At this point let me clear up a misconception. It is often said that people stammer because they are nervous. The contrary is, however, the case, the stammer being the cause of the nervousness. The writer has known many stammerers who were the reverse of nervous—except when they stammered. Stammering has no fixed relation to any other psychopathic condition, such as nervousness. Stammerers are of all types, and the one thing common is the disposition to stammer. This is the root of all the evil, including the nervousness. Whether the stammer is hereditary, or whether it originated from shock, from maladjustment to early environment, from imitation, or from the forced change of a naturally left-handed person to right-handed writing, the result tends to be the same; it becomes more and more deeply rooted in the fear complex. No matter how the trouble began, whether it is an innate or an acquired defect of psycho-physical coordination, it will as a rule present this common problem. Thus the central task of treatment is the removal of the fear complex.

It should be clear by now that stammering is not a disorder of the voice or of breathing, but a disorder or incoordination of speech centres of the brain. There is no more striking proof of this than the fact that most stammerers can speak or read to themselves with perfect ease. After a distressing failure in the presence of others, the stammerer will go into the next room and talk to himself quite fluently. One can state, therefore, that if there were no personal equation there would be no

stammering. True, stammering is a psychic and not a physical phenomenon, and the treatment must be based on that foundation.

Nature of Corrective Measures.

Corrective measures aim at the readaptation of the stammerer to his environment by the recreation of his personality. Herein lie both the interest and the difficulty of treatment. The patient's outlook must be rationalized if he is to gain permanent relief. He must in fact make a fresh beginning. Psychoanalysis may be necessary in some cases to discover inhibiting factors detrimental to his well-being or accentuating the condition. But as a rule the patient's inhibitions will arise from the stammer itself, and can be discovered by observation and questioning. Constructive criticism will be helpful, and the stammerer will be encouraged to be confident and self-reliant. Not all stammerers will be dominated to the same degree by the ramified system of inhibitions, though this system is the type development of the "perfect" stammerer. Child stammerers, for instance, will not be so highly conscious of their handicap as an adult stammerer. The slight stutterer who is not subject to the fear complex is not a true stammerer. For such patients elocutionary and respiratory exercises will have beneficial results, particularly if they produce increased confidence — that, indeed, is the test of their success. But elocutionary and respiratory exercises are not a direct approach to the problem of the fear complex, and in the cases of true stammerers they are at most merely subsidiary to the means employed to rationalize the patient's personality and fit him for his environment. The problem which the patient must in most cases be helped to solve is purely a psychic one; his vocal and breathing organs are as free from defect as the non-stammerer's. The aims of treatment, then, are the elimination of the fear complex, the replacement of strain by ease, a changed outlook, and the development of an agreeable method of speaking in interaction with these.

Rhythmic Practice.

Stammerers commencing treatment can sometimes hardly speak at all owing to the conditions of strain. They are obviously in need of relaxation and require the simplest and most elemental way of speaking. When they are sufficiently relaxed they are induced to speak in a rhythmic cadence, with lengthened and full vowel sounds. It will be found necessary, to maintain a smooth flow of rhythm, that arms and legs be used to assist in keeping time. The patient will discover, for the first time, that if he exaggerates or extends sufficiently the rhythm and the vowels he cannot stammer (for example, by singing or reciting). This should be a discovery fraught with new hope; an intelligent stammerer will see at last a means of escape from bondage, and the psychic reaction will be of the utmost benefit. The test of every step in treatment is the mental effect on the patient. The new method of speaking is so elemental that the patient must abandon all reserve with his instructor and fellow patients; he must throw to the winds, too, all his old attempts at concealment. Unless he gives up his "old life" unreservedly he will not find a new one. The method of rhythmic speaking will be insisted upon invariably in his speech with fellow patients, with visitors to the treatment room, and with his friends when he meets them outside it. He may alternatively be isolated from his friends till he has acquired some proficiency in rhythmic speaking; but it is essential that he employ it on all occasions and not revert to his old haphazard methods.

Class treatment is most helpful; the spirit of mutual help and the will to "get well" are powerful, and the all-important factors of complete absence of reserve and feeling of ease will be attained for the first time. The knowledge by the patient's friends of the nature of his work is another factor that will enable him to throw off the cloak of concealment.

Naturally, the subject matter of the rhythmic practice will be simple at first—long-vowelled monosyllables, consecutive numbers, nursery rhymes. The vowels must be drawn out and the consonants said softly so that the patient speaks a vowel-rhythm with no consonantal impediments to the smoothness. The growing mastery of a smooth rhythm should give great psychic relief. At all times the patient must be perfectly relaxed, and relaxation exercises must form part of the daily programme.

Connected work will follow, as the asking and answering of questions, and simple descriptions and readings, in rhythm; here again the vowels will be kept full and round and consonantal effort will be diminished. The rhythm will still be exaggerated and arms and legs will still beat time like a pendulum. The core of fear is, however, gradually being broken down, and gradually the rhythm may be allowed to lose its earlier exaggeration and be toned down to an agreeable and pleasant way of speaking. The patient should not feel self-conscious about the new manner of speaking; he should remember that every person has his peculiar intonation, and that only friends will notice how his new way differs from the old way, and that it will be preferred by them to the old spasmodic utterance. Auto-suggestion must predominate.

Work will follow of a more advanced kind—debates and discussions, and any form of work which the ingenuity of the class may suggest. Each member may now practise by relaxation the overcoming of any special difficulties that may trouble him—for example, using the house telephone. Possibly the rhythm may be given greater flexibility for different uses, as recitation; yet the patient would be wise not to depart far from his new, sure way, lest he lose it on an occasion and find himself in his old troubles. Let him always remember that his rhythm will be agreeable to those who hear it, if he uses a lowered pitch of voice with soft expression.

Far-reaching and beneficial results will be obtained from the rhythm in stilling the psychic conflict and rendering the personality expressive. The patient will lose his inferiority complex and his repression. The subsequent history of the patient will have relation to his strength of purpose and happiness in his environment. But his acceptance of the rhythm will be rewarded by the ever-increasing field of its application, and the integration of his personality will replace the old disunity.

In 1939, at the School for Speech Disorders, New York, and at Witwatersrand University, Johannesburg, demonstrations were given by request and the purport of this system was explained.

The psychological, physiological and neurological aspects have been dealt with at various congresses and societies, and were published in the transactions of the various sessions of the Australasian Medical Congress (British Medical Association) and elsewhere.

Bibliography.

T. G. Leary: "Significance of Stammering and Stuttering with Corrective Measures", THE MEDICAL JOURNAL OF AUSTRALIA, September 28, 1918, page 259; THE MEDICAL JOURNAL OF AUSTRALIA, October 5, 1929, page 505; THE MEDICAL JOURNAL OF AUSTRALIA, September 25, 1920, page 324; "Stammering as a Psycho-Neurosis: A Plea for Corrective Measures", THE MEDICAL JOURNAL OF AUSTRALIA, February 26, 1927, page 299; "Stammering, a National Tragedy: A Plea for Further Research and Scientific Treatment", THE MEDICAL JOURNAL OF AUSTRALIA, March 12, 1932, page 355; THE MEDICAL JOURNAL OF AUSTRALIA, February 24, 1934, page 261.

Notes on Books, Current Journals and New Appliances.

ILLUSTRATIONS OF BANDAGING AND FIRST AID.

LOIS OAKES'S splendid book should be in the hands of every teacher of first aid and bandaging whether of amateur classes or those for nurses and students.[1] The illustrations are very good and sufficiently numerous to enable a student to learn any of the methods set out in the minimum of time. The chapter on the Thomas splint is especially useful and brings the book up to date. After perusal we are satisfied that the triangular bandage could be put to much more use in casualty and other hospital departments than it is.

[1] "Illustrations of Bandaging and First-Aid", compiled by Lois Oakes, S.R.N., D.N. (Leeds and London); Second Edition; 1942. Edinburgh: E. and S. Livingstone. Demy 8vo, pp. 264, with 300 illustrations. Price: de luxe edition, 6s. net; cheap-paper edition, 4s. 6d. net.

The Medical Journal of Australia

SATURDAY, AUGUST 15, 1942.

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MEDICAL OFFICERS OF THE SERVICES AND THEIR STUDY.

EVERY intelligent person knows that the acquisition of a university degree in medicine confers on a graduand the right of entry into a hall of learning where knowledge must be pursued for the whole of life. Everyday speech does not always convey this impression—too often we hear it said that Dr. So-and-So was educated at, say, "A.B." School and at "Y.Z." University, as though nothing lay beyond the suffixing of certain letters to the name and the assumption as an affix of the courtesy title of "Doctor". As a matter of fact the new medical graduate soon discovers that a discontinuance of study leaves him in a backwash. He may for a while, by judicious silence and close attention to the "shop" that is talked around him, be able to hide his ignorance and even to a certain extent succeed in making good the defect, but before long serious lacunæ will appear which no measure of bluff can cover. In normal times most medical students on graduation are appointed as resident medical officers to some large hospital, and in many places the legal enactments dealing with medical registration require that new graduates shall be employed in this way before they can be recognized by the law as duly qualified medical practitioners. Whether a resident medical officer emerges at the end of his term as a natural student or as a drone with no thought or fear of consequence will depend partly on his own inclinations and temperament, his own sense of values, and partly on the atmosphere of the hospital. When an institution can boast of its own clinical society as an active and enterprising body at whose meetings seniors and juniors can and do meet for discussion and discovery, or when staff meetings are really effective and are not looked on as a tiresome nuisance, resident medical officers on their retirement will take with them an inspiring and lasting impression—the young graduate in medicine is often a hero worshipper and generally a good copyist. Fortunate is the junior hospital "resident" when the honorary officer under whom he serves directs him in a search of the literature and in the "writing up" of some interesting case that has come under their notice. In normal times many new graduates have both precept and example to help them to become natural students. But times are not normal; the upheaval of war has dislocated all our lives. Many men have been taken, often at a moment's notice, from their usual avocations and have had to adapt themselves to duties of which they previously had no notion. It will be admitted that the dislocation suffered by doctors has not been so complete as that experienced by many engaged in other occupations, for, whether they belong to the armed forces or are enrolled in the Emergency Civil Medical Practitioner Service, doctors still do doctoring in some form or other. But there is a dislocation and it affects particularly the younger graduates at a time when they stand in need of hospital experience, or, having spent some short period in hospital work, ought to have opportunities of applying their observations, of extending them and of forming enduring habits of study.

The young graduate who joins a medical service such as that of the army will probably be assigned to the important and necessary duties of a camp; he may become a regimental medical officer or be attached to a field ambulance; he may be called on to serve on the staff of a general hospital. There is no need to describe the type of work done by the junior medical officer in the Services. Much of it consists of what may be described as routine procedure, and though the medical officer will learn a great deal about many aspects of preventive medicine and the effect of active service conditions on the mental attitude of the soldier, it must be confessed that his knowledge of general medicine will tend to become somewhat vague, and on eventual demobilization he will find himself in regard to general practice in a position less favourable than that of a young graduate fresh from hospital practice. But it may be objected that much the same sort of thing happens to any man who leaves his peace-time occupation to join the armed forces. This is true. In reply it will no doubt be granted that a man who gives up his calling to serve the country at war should, on demobilization, find at his disposal some arrangement by means of which he can reestablish himself in his peace-time occupation. In regard to medical officers, a cogent argument for such a provision is at hand in the fact that a medical man fresh from active service who takes up private practice has in his charge the health and sometimes the very lives of the members of the community. It is therefore in the interest of both the medical practitioner and the public that the former should retain studious habits during his period of active service and be able to "brush up" his medicine when he once again becomes a civilian.

Let us take these two desiderata in the reverse order. As already stated, it is clear that when hostilities cease the soldier will have to be provided with some educational assistance on his return to civilian life. This was recognized in the war of 1914-1918. Colonel A. Graham Butler tells us in the second volume of "The Australian Army Medical Services in the War of 1914-1918" that the idea of re-creating in the soldier "the constructive outlook proper to peace" and of preparing him for return to civil life was first conceived in the Canadian force. Its

application to the Australian Imperial Force was suggested to the Australian Official War Correspondent by Lieutenant G. L. Mayman, of the Third Division. Thus early in 1918, long before hostilities ceased, the Official War Correspondent discussed the matter with Sir William Birdwood and Sir Brudenell White. Early in May, 1918, General Birdwood invited Chaplain the Right Reverend George Merrick Long to draft proposals for an "education" scheme for the Australian Imperial Force. Bishop Long's scheme was examined by a select committee of senior officers. As an outcome a scheme was devised to operate in two stages, one during the war and one after demobilization. After demobilization began the scheme was taken up vigorously by the Prime Minister, Mr. W. M. Hughes, and was expanded to include "Non-Military Employment". On March 22, 1919, the number of enrolments in the Australian Imperial Force educational classes was 12,832 and 638 of these were at universities. In June, 1919, the number of medical enrolments at universities was 210. Already at this stage of the present war an Army Education Service has been started. It is described in *The Australian Quarterly* of June, 1942, as the largest experiment in adult education yet attempted in Australia. The War Cabinet approved of the creation of the service in March, 1941. Like the scheme devised by Bishop Long in 1918, the present service has two aims. First of all, during the war, "it seeks to provide troops with educational facilities and mental recreation in order to sustain morale and dispel boredom. It also seeks to allow those men who have intellectual interests to keep in touch with intellectual life and to stimulate such interests in as many others as possible." This object is being actively pursued under an advisory body known as the Australian Services Education Council by a full-time staff, of which Lieutenant-Colonel R. B. Madgwick is the head. The second aim of the Army Education Service, which will necessarily be deferred till after the war, will be an endeavour "so to give vocational guidance and training to troops that repatriation will be effected with the greatest ease and efficiency". Medical officers will no doubt be able to share in these arrangements, as they did after the last war. Further, we cannot imagine that when the post-war period comes any scheme of vocational guidance and training in Australia will be confined to the army. Perhaps one important fact should be mentioned. After the war of 1914-1918 much of the study undertaken by medical officers was carried out in Great Britain on the return of the Australian Imperial Force from France. In this war education schemes for medical officers will presumably have to be carried out almost entirely in Australia. We can well imagine that in these circumstances a heavy duty will devolve upon post-graduate committees in medicine—a fact which they will do well to bear in mind, even at this stage.

There remains for consideration the problem of how medical officers of the services can be encouraged to maintain studious habits during their periods of active service. It has been said with some justification that the work of a medical officer, at any rate of the army, consists of periods of intense activity alternating with periods of utter boredom. If this is true, the periods of boredom may by some sort of planning be converted into periods of studious activity. A great deal depends on the attitude of those at the top. For this reason the report recently received and published of a clinical meeting of the Ninth Australian General Hospital in South Australia is encouraging. Similar reports will be welcomed from other units, and no effort will be spared to make space available for their publication. That important observations are being made and recorded by medical officers in the services is clear from the articles that have been published from time to time in THE MEDICAL JOURNAL OF AUSTRALIA and *The Australian and New Zealand Journal of Surgery*. These, of course, deal with special subjects and generally represent work carried out by specially selected officers. What is required is a constant and lively interest in the problems of general medicine and surgery by medical officers in the more junior positions. If we can judge from the requests to have journals forwarded to men whose units have been changed, there is a good deal of interest in medical literature. This interest must be fostered and increased. The senior members of units can do this if they will. It may not be possible for general hospitals to run a clinical society, but they can with no difficulty contrive something analogous to a staff meeting or a study circle. The proper persons to organise such gatherings are the senior physicians and the senior surgeons of hospitals acting under the stimulus of the commanding officer. Such meetings need not be limited to one unit; any medical officer attached to any unit in the vicinity should be sought and invited to attend. Medical men, when they join any of the three services, should not let it appear that they have left the hall of learning which they entered when they first acquired their university degrees qualifying them to practise.

Current Comment.

FIRST AID POSTS.

SINCE the outbreak of war articles on many aspects of war medicine and surgery have been published in this journal; many of these have been contributed by practitioners with first-hand experience of the subjects about which they write. In the editorial columns, too, attention has been drawn to articles and discussions that have been published in other journals. Until now practically nothing has been published about first aid posts and the rôle which they are destined to play. In this week's issue there appears an account of a talk given by Major A. W. L. Row at Brisbane to a committee of medical officers of first aid posts. It is to be hoped that all practitioners will read what Major Row had to say. We would suggest that at the same time they should read two articles published recently in the *British Medical Journal*—one on first aid post work in air raids by L. Arthur N. Line (February 7, 1942, page 193), the other on a first aid post in action by Arthur Sheard (May 16, 1942, page 617). These two articles show the truth of Major Row's contention that the people manning first aid posts do a bigger job than many persons in authority realize. Line reports that his unit in one raid received eighty casualties—six suffered from abrasions and contusions (two were elderly and shocked patients), two suffered from head wounds and concussion, one suffered from a penetrating wound of the skull and was moribund on admission, two suffered from compound fractures, three from simple fracture, 26 from lacerated wounds caused by flying débris, one from (glass) abrasions of both corneæ, one from a deeply penetrating wound of the thigh caused by flying glass and 38 from multiple wounds from flying glass. Sheard reports that 33 casualties passed through the aid post in one air raid. Of these eight suffered from severe injuries and 25 from

injuries which were comparatively slight. All of the 25 suffered from shock in varying degree; half of them came in on stretchers and recovered sufficiently to be able to walk out. But, as already stated, these two articles should be read; they are already available to all readers of this journal. Special attention is directed to Sheard's remarks on improvements suggested by experience. From what can be gathered the dirty condition of the skin of persons injured in air raids has to be seen to be believed.

The voluntary workers attached to first aid posts in Australian centres of population are to be commended for the keenness with which they stick to their self-imposed task of preparing themselves to serve the community in time of need. Those who have dropped out when the excitement connected with organization of the posts passed and routine work had to be undertaken, are better in some other sphere of service or in none at all. Routine work in the attainment of efficiency is naturally somewhat dull and superintendents of aid posts are wise if they try to keep the interest of their assistants alive by occasional lectures or demonstrations or both. Even intelligent people become weary of a dull routine when they know that its dulness can be relieved from time to time. At such gatherings discussion and the asking of questions should be encouraged. First aid post workers are willing workers, they want to work in an atmosphere of cooperation, not as members of a class of school children or as junior probationers in a hospital. After all even a junior probationer who is intelligent may have ideas that will be useful to her matron.

GAS IN THE GASTRO-INTESTINAL TRACT.

A STUDY of a skiagram of the abdomen will often reveal information of value in the diagnosis and treatment of intestinal obstruction, and therefore, as John R. Payne and Curtis B. Nessa[1] remark, it is necessary for clinicians to have a clear understanding of certain normal variations in the X-ray appearances of the distribution of the intestinal gases. These authors were concerned with infants and children, but many of their remarks are equally applicable to adults. In adults there is normally no gas in the small bowel, so that its presence as detected by a skiagram is of diagnostic importance, as are also distended loops of intestine with or without fluid levels. In the partial or more chronic forms of obstruction the value of examining the patient with the screen after a barium meal is obvious and needs no comment. In children, however, gas may be seen in the small bowel up to the age of seven years. Payne and Nessa took skiagrams of the abdomens of normal infants within a few minutes of birth and then at intervals thereafter and showed that gas appeared in the stomach within ten minutes of birth, a fact to which they drew attention as giving further confirmation to the swallowed air theory of the origin of most intestinal gas. Within four hours of birth the gas should have reached the rectum and should be distributed throughout the small and large bowel. For the early diagnosis of intestinal obstruction due to a congenital lesion, such as atresia of the duodenum or small bowel, a skiagram may be of great help, as the delay in the passage of the gas to the sigmoid colon and rectum will be promptly recognized and will enable operation to be performed before the child's condition deteriorates. In infants under the age of eighteen months the gas in the gastro-intestinal tract should be equally distributed between the small and large bowel. Between the ages of eighteen months and seven years the gas gradually disappears from the small bowel. In a case of intussusception in which the diagnosis is in doubt, a skiagram may be of considerable value, but, as Payne and Nessa point out, a knowledge of the normal variations in these children in the distribution of the intestinal gases, which they have described, is essential.

The classical method of determining the length of an atresic portion of the rectum and anus is that described by Wangensteen and Rice and consists of taking skiagrams with the infant held in the inverted position and with the mercury bulb of a thermometer pressed into the anal dimple or passed up the rectum to the area of atresia. Before the application of this test it is necessary to remember the normal delay in the passage of the gas to the rectum and accordingly to wait until the infant is more than six hours old, that is, until it can be reasonably certain that gas has passed into the rectum. Incidentally, this procedure does not allow for the failure of the gas to penetrate through any meconium that may have accumulated at the bottom of the proximal portion of the rectum.

Payne and Nessa are to be commended for their investigation which, although simple and straightforward, has given results of definite value to the pædiatrician.

[1] *Surgery*, February, 1942.

PYROGEN.

WHEN in 1911 Hort and Penfold announced that distilled water incubated for some time in unsterilized vessels produced pyrexia when injected intravenously, whereas freshly distilled water did not, the significance of the discovery was not generally realized.[1] The fever-producing substance was stated to be capable of being separated from any bacteria present by appropriate methods of filtering and was named pyrogen. Twelve years afterwards Siebert completely confirmed these results and proved that pyrogen was of bacterial origin.[2] Further research seemed at first to indicate that the capacity to produce pyrogen was limited to a few groups of bacteria, but this view had to be abandoned in the light of the results of several separate investigations. One of the most recent experimental inquiries into this subject is reported by Co Tui and M. H. Schrift, who examined eighteen strains of microorganisms belonging to different genera.[3] Their results taken with those of other workers in the same field are certainly interesting. Pyrogen production is more widespread than was imagined; it is not associated with pathogenicity, chromogenicity, nucleic acid or with the capacity to take the Gram stain. What the nature of pyrogen is and whether it is related to the toxic substances isolated by various workers from bacteria remain unrevealed and demand further inquiry. That a yeast should be a source of pyrogen indicates that organisms higher in the scale than bacteria come into this category. It is obvious that only the fringe of the subject has been explored. That certain protozoa should cause high pyrexia presents us with the problem of how much of the febrile reaction is due to pyrogen and how much to a reaction of the host to a quickly multiplying invader. Even metazoa can also evoke fever in the host and again an inviting field for research is disclosed. The chemical nature and affinities of pyrogen have not as yet been discovered; when this happens, as assuredly it one day will, a powerful agent will be placed in the hands of the profession.

[1] *The British Medical Journal*, Volume II, 1911, page 1589.
[2] *American Journal of Physiology*, Volume LXVII, 1923, page 90.
[3] *The Journal of Laboratory and Clinical Medicine*, Volume XXVII, February, 1942, page 569.

TETANUS AND WAR CASUALTIES.

A NOTE of some importance has been published by E. J. Radley Smith in the *Proceedings of the Royal Society of Medicine* for March, 1942. He reports seven cases of tetanus occurring in a London sector during two years. (In one year this sector treated 4,500 civilian and 6,500 Service casualties.) The report shows that 3,000 units of anti-tetanic serum given soon after wounding do not prevent tetanus, nor does such a dose guarantee that a subsequent infection will be local, delayed or mild. No tetanus occurred among troops who had been actively immunized, although among them most favourable conditions for its development existed.

Abstracts from Medical Literature.

DERMATOLOGY.

Hereditary Xanthomatosis.

D. BLOOM, S. R. KAUFMAN AND R. A. STEVENS (*Archives of Dermatology and Syphilology*, January, 1942) state that in accordance with the classification accepted by Thannhauser and Magendertz and other investigators, primary essential xanthomatosis may be divided into two main types, *xanthoma tuberosum* and *xanthoma disseminatum*. The distinction between these forms rests on a variety of clinical and biochemical differences, which concern the cholesterol content of the blood as well as the type and localization of the cutaneous and visceral lesions. In *xanthoma disseminatum* numerous fine papules and plaques are found on the flexor surfaces of the extremities, especially in the axillary folds. The mucous membrane of the mouth, pharynx and larynx is often affected, and as a result of involvement of the pituitary gland *diabetes insipidus* frequently occurs. The cholesterol content of the blood is usually normal in this disease. The authors discuss *xanthoma tuberosum* with reference to a family group of patients. It is characterized by nodules, tumour and plaques located predominantly on the elbows, knees and buttocks, and over the Achilles tendons and the tendons and joints of the fingers, toes, hands and feet. The cholesterol content of the blood is usually increased and has led to the classification of *xanthoma tuberosum* as "hypercholesteræmic". Frequent association of the condition with cardio-vascular disease is particularly significant. The tendency for *xanthoma tuberosum* to occur in several members of a family has been known for a long time. The association of *xanthoma tuberosum* with hypercholesteræmia, cardio-vascular involvement and sudden death has been observed by many investigators. The family studied by the authors was of Syrian descent. The parents were second cousins once removed and had thirteen children. Four children may be excluded from their survey, since one of them was still an infant and three had died at or shortly after birth. In five of the nine remaining children *xanthoma tuberosum* developed, and four of these five died more or less suddenly. All five had hypercholesteræmia. A cholesterol-free diet may be helpful in protecting carriers of the hypercholesteræmic trait against the development of cutaneous and cardio-vascular lesions.

Testosterone Propionate in the Treatment of Male Post-Climacteric Dermatoses.

L. HOLLANDER AND H. R. VOGEL (*Archives of Dermatology and Syphilology*, February, 1942) state that definite clinical evidence is at hand that at various periods of the life cycle hormonal disturbances play undisputed rôles in diseases of the skin. This is especially true of a hormonal gonadal disturbance, which is evidenced by such conditions as *tinea tonsurans* during childhood, *acne juvenalis* during adolescence, the so-called tumour of pregnancy of the alveolar process, *keraderma climactericum* of Haxthansen, senile vaginitis and *keratosis senilis* of the aged. It has been observed that inflammations of the skin in older men frequently behave according to a particular pattern. It is not uncommon for even uncomplicated and mild dermatitis to assume the major proportions of exfoliative dermatitis. In an older man, after the establishment of dermatitis, the skin assumes an increasingly dry appearance and flakes off readily, as though the horny layer had lost the adhesive substances which bind it to the underlying layers. Intense itching, malaise, chills, loss of weight and strength and a slow response to remedial agents are noted among some of the characteristics, so that one is confronted with baffling problems in therapeusis. With the supposition in mind that after the male climacteric there occurs a hormonal gonadal disturbance that acts as a complicating or influencing factor in these dermatoses, the authors decided to try the use of testosterone propionate as an aid in treatment. They quote various other workers' observations on the use of testosterone propionate. The authors furnish a report of cases treated by them with synthetic testosterone propionate used in an ointment base. The preparation was rubbed in over unaffected surfaces of skin; one inunction was used, which contained four milligrammes of testosterone propionate. The histories of eight patients and the effects of inunctions of testosterone propionate are reported. The authors consider that the use of this substance in the treatment of presenile and senile dermatitis of men appears rational, in view of the fact that cutaneous changes in the post-climacteric period appear to be a definite entity. They found that in their patients amelioration of the symptoms began only after the use of inunctions of testosterone propionate.

The Practical Management of Eczema in Infants and Children.

E. D. OSBORNE, J. W. JORDAN AND J. J. HALLETT (*New York State Journal of Medicine*, January, 1942) call attention to the inadequacies of scratch, intradermal and patch tests, and to elimination diets in the management of infants and children suffering from eczema. They conclude that dietary regulations are of minor importance for children past the age of three years, that they are slightly more important for children aged from one to three years, and that they are of importance for 15% to 20% of babies aged under one year. The authors have reviewed the records of 124 patients who were carefully examined and treated during the years from 1938 to 1940. Fifty *per centum* of all infants and children suffering from eczema are entirely cured when placed in hospital in the ordinary children's ward, kept away from wool and feathers, and given normal diets. The authors have frequently seen the development of a patch of erythematosquamous eczema in an infant or child at the exact site of contact with wool or feathers. Usually this original patch has been on the cheeks, neck, elbows, wrists or popliteal space, and subsequently atopic dermatitis has developed in other areas as a result of dissemination of the offending allergen in the blood stream. The method of procedure is as follows. In the first place the investigation covers: (*a*) the family history of allergy (of slight importance in the individual case); (*b*) history of reactions to specific foods; (*c*) age at onset (the authors have never seen a case in a child under ten years of age); (*d*) exact site of the first area of eczema; (*e*) history of lesions caused by contact with substances such as soap and medicated oils, toys *et cetera*. In the second place the investigation requires examination of the patient with particular reference to the area first affected by eczema and to the presence of sharply outlined free and affected areas. In the third place an outline of the treatment is given to the parents, who often refuse to believe in the importance of external contact and environmental allergens. The authors insist on the removal of all silk and wool from the room. This usually means the child's admission to hospital for four to eight weeks. Subsequent visits to the medical attendant are required at intervals of one or two weeks. At the first sign of a recurrence the child and his environment are reexamined. When the child is free from eruption a search is made for a specific cause of the eczema. This can be done by patch tests, which are not always conclusive and, in the authors' opinion, not so valuable as actual clinical trial. The most common contact and environmental allergens of importance in eczema of infants and children are: (*a*) water-soluble protein allergens—wool, silk, feathers and other animal epidermal products; (*b*) chemical substances, soaps, lacquered objects, fish oil, oils from fruits and vegetables *et cetera*. For local treatment in acute cases with vesiculation and pustule formation the authors advise wet dressings of Burrows's solution, a saturated solution of boric acid, or a 1 in 4,000 solution of potassium permanganate, applied for six to eight hours a day. These are later followed by soothing ointments; boric acid (5%) in petrolatum is satisfactory, as are calamine lotion, calamine liniment, and emulsions of olive oil and water. Crude coal tar, beginning with 2% strength, is valuable. Whilst coal tar is being used the child should not be exposed to sunlight unless the coal tar is removed first. The authors advise the use of soap substitutes. They recommend a sulphonated oil as a substitute for toilet soap. As a substitute for laundry soap or chemicals they recommend a powder containing aryl sulphonate.

UROLOGY.

Carcinoma of the Prostate.

H. GORDON (*Urologic and Cutaneous Review*, October, 1941) declares that carcinoma of the prostate constitutes a threat of increasing significance to the male population. The all-important factor is early diagnosis, this depending on the early recognition of prostatic types of symptoms by the patient, confirmation of this by his medical attendant, and then full urological diagnosis. Carcinoma of the prostate begins most often in the posterior or lateral lobes of the true prostate gland and is probably not related causally to the common senile adenoma which is a hyperplasia of periurethral submucous glands; these glands are not properly prostatic at all. One great danger is that "occult" carcinoma of the prostate is not at all uncommon, and metastases from such a source may constitute the first clinical

danger signs. Most clinical observers consider that the results of either the Young type of radical resection or of radium or radiotherapy are disappointing in all but cases diagnosed at a very early stage.

The Motility of Spermatozoa.

A. I. WEISMAN (*Urologic and Cutaneous Review*, January, 1942) states that very little has been written, and very little is known, about the motility of sperm cells. The common idea has been to obtain a condom specimen as quickly as possible after coitus and to keep it warm, even in a body temperature incubator. This is a mistake. The ejaculation should be made into a clean, wide-mouthed glass receptacle, and this is kept at ordinary room temperature, away from wind and dust. For the first fifteen or twenty minutes the sperm cells lie mostly immobile, enmeshed in thick mucus; at the end of this short period, the mucus liquefies and the sperm cells move about. One or two drops of the liquefied specimen are placed on a glass slide and covered with a slip. The slide should not be warmed or allowed to become too cold. The approximate percentage of motile forms and their type of movement (whether quick and darting or slow and sluggish) are noted. Apparently motionless spermatozoa may be entangled in mucous threads and should be watched for signs of life. A good specimen should give evidence of rapid movements in about 80% of the total number of sperm cells. The specimen should be watched by repetition of the examination from the total ejaculate every four hours during the day. After twenty-four hours there should be some motion left in some of the sperm cells, and the motility of some may persist up to forty-eight hours or more. This endurance of sperm life is of great significance in the estimation of the power of fertility. Normally, the vaginal pH varies from 3·5 to 4·5, and this acidity is hostile to the sperm cells, which normally exist in an alkaline medium. After three hours, all sperm cells remaining in the vagina are dead, so that if at the end of three hours after coitus mobile sperm cells are found in the vagina, one can be certain that the sperm cells are of good type. The Hühner test is to collect semen from the cervical canal with a pipette, and if sperm cells are found, they are assumed to have penetrated normally. This certainly applies if viable forms are seen during the first three or four hours, but after that they should have ascended into the uterus. Sperm cells found here after four hours should lead one to suspect their entanglement in a mesh of abnormal cervical mucus. Therefore, the most useful test is a simple ejaculation into a glass container, and prolonged observation of sperm motility over twenty-four hours at room temperature.

Sulphonamides in Renal Infections.

R. C. BORST (*New York State Journal of Medicine*, February, 1942) discusses the effectiveness of some more recently introduced sulphonamides on bacteria commonly encountered in infections of the upper portion of the urinary tract. His conclusions are that so far no single drug has been discovered which is effective for all types of urinary infection. The urinary antiseptic that can be excreted in bactericidal concentration by a really badly damaged kidney is not known. Rapid excretion is a great advantage in the use of these drugs, since when this takes place a low blood level will allow the same urinary concentration as a high blood level with slow elimination. Sulphapyridine is the most toxic sulphonamide and should have no place in urinary tract therapy. Sulphathiazole in small doses is effective as a mild urinary antiseptic, even when the renal function is moderately impaired. Sulphadiazine has a higher and more prolonged blood concentration than the other more commonly used sulphonamides and is superior in its effectiveness against the streptococcus, the pneumococcus, Friedländer's bacillus and the *Escherichia coli* group. It is equal, but not superior, to sulphathiazole in its therapeutic activity against the staphylococcus, but should be chosen because of its lower toxicity.

Prostatic Obstruction in Young Men.

H. A. FOWLER (*The Journal of Urology*, January, 1942) draws attention to the rare but definite occurrence of prostatic obstruction in young men in the second and third decades. He has encountered five such cases in eighteen years. The quantity of obstructing tissue is relatively slight. Only two specimens were examined microscopically; both were remarkable, in that the hypertrophied tissue consisted of muscle with little evidence of epithelial structures. The author remarks that the genesis of these enlargements cannot be due to hormonal dysfunction caused by the male climacteric.

National Emergency Measures.

WORK AND EQUIPMENT OF FIRST AID POSTS.

THE following is an account of a talk given by Major A. W. L. Row, of the 112th Military Hospital, to a committee of medical officers of first aid posts, Brisbane, regarding the work and equipment of aid posts.

Major Row said he felt that people who were asked to man the first aid posts were doing a very much bigger job than the authorities realized. It was all very well to say that no seriously wounded person would be taken to the first aid posts, but this was assuming that all the first aid posts did in an air raid was to ring up the ambulance to collect casualties here and there and to take them to such and such a place. It was not realized that a raid did not consist of one wave, but of several, and the enemy decided how long the interval till the next wave would be. It would be highly dangerous to have lines of ambulances converging to one central point if another wave of bombers came over. There was definite evidence that the Japanese bombed hospitals, and should they see such a convergence occurring it was quite likely that they would bomb the central point. If sufficient medical men were collected there to deal with all the casualties from the city, what would happen to the medical personnel? It was a big responsibility for anyone to shoulder, to put work into one central point; it might cripple Brisbane temporarily in regard to its medical services. Any clustering invited bombing. Under those conditions, if casualties were not brought to the hospital at once, their treatment would fall to the lot of the mobile squads, where they lay, or they would be taken to the first aid post, either by ambulance or by some other means. The tendency of the people would be to rush them to the first aid posts.

The question was asked whether there was any reason for considering that a first aid post would be any different from a regimental aid post in action. Major Row replied that the first aid post would be a regimental aid post in many cases, because the people would act as they thought best, forgetting previous instructions for the time being. Excitement was the crowning factor in a raid; everyone would get excited and would feel that his locality was the only place that was bombed. To take what happened in London, the initial plan was to take all the casualties of one area to one central hospital in that area. That sounded a sensible enough scheme, but the authorities overlooked the fact that there were huge barriers of fire and debris which might cut off that hospital from large areas. They also overlooked the fact that the hospital might itself be bombed and hence not ready to receive casualties. So then the authorities spread their casualties to the perimeter and took them in when the raid was over. What chance would there be of operating on several hundred casualties inside the first six hours after injury if they were all sent to one or even two hospitals? So a central controlling officer was appointed in different areas and messages were sent to him regarding the number and nature of casualties, and he arranged for the required number of ambulances to be sent and told the ambulance officers to which hospitals they were to take their patients, in order to avoid over-crowding of any one hospital. Better results were obtained as soon as this plan was adopted. Previously up to twenty-four hours had passed before some patients could be treated. Major Row thought that here there was a tendency to ignore the usefulness of all suburban hospitals which he considered should be fully organized for use, as they could absorb a large number of less severely injured persons and so save a crowding out of the bigger hospitals with the less important work.

The question was asked, could Major Row give any suggestions about the equipment of first aid posts as he saw them. Major Row said if it were to be used solely for first aid, he thought the post would need very little equipment. Actually he considered it would be better to do any surgical work at the local hospital or nursing home when the raid was over. To expect surgical work to be done at a first aid post, without a good deal of equipment and material, and while the post was in a state of emotional upheaval, would be asking for the impossible. Medical officers would be dealing with emotional conditions as much as surgical ones, and if the lightly wounded patients could

be taken away to the nursing home, it would give workers a much better chance by avoiding over-crowding of the first aid post. But there would be seriously wounded persons, too, brought there by their friends or perhaps by ambulance. It would be the greatest presumption to think that one big hospital was certain to function easily as soon as the raid was over.

The question was asked how the hospitals in London fared. Major Row said that well-trained surgical teams could manage one case in one theatre in one hour; that was an average for severe cases and it had to be remembered that six hours was the time limit of safety if sepsis was to be avoided. In London there were mobile teams, including a doctor, to go round examining patients where they were, and to determine the severity of the condition and whether the patient should be sent to hospital; to give an adequate dose of morphine and to attach a label to the patient's wrist with simple directions and to mark on it or on the patient's forehead the dose of morphine given and the time. Ample time should be given for the drug to take effect before the casualty was moved; this was expedited by massage of the injection area. Generally half a grain of morphine had proved a much more effective safeguard than the quarter-grain dose. The patient should be thoroughly drowsy and comfortable before he was allowed to be moved. The dose would, of course, vary according to circumstances, but severe pain required and would call for a big dose of morphine.

Major Row was asked with what conditions he considered a first aid post would have to cope. Major Row replied that they would have to cope first with excited or emotionally shocked and grief stricken people, secondly, with lightly injured persons, and thirdly, they might have to serve as a reporting centre for serious casualties who needed immediate attention by a doctor or skilled first aid worker. A point of immense importance was that if a seriously damaged casualty were rushed to hospital while he was severely shocked, he would probably die *en route* or shortly after reaching his destination, whereas if time were given for an adequate dose of morphine to take effect before he was put into the ambulance at all, a much different and happier story would be told.

Major Row said he had had no idea as to how dangerous this rushing might be before he was wounded himself. He received morphine and was not moved for half an hour afterwards, and he was curious enough to note that his radial pulse was full and steady. Then he was rushed to hospital, and when he reached there his condition was so bad that he gave a lot of trouble before he was fit to be operated on. That journey was a nightmare. The slightest swerve, especially around corners, gave the patient hell; so did a swerve round a pedestrian or any other obstacle. Medical men should insist on a maximum speed round corners of only a few miles per hour, and should not allow drivers to go any faster, and should remember that swerves at any speed were almost as bad as corners.

With regard to dosage of morphine, Major Row had information concerning the transport of wounded men out to a waiting hospital ship at Tobruk. As soon as a general routine was adopted of giving a half grain of morphine to each severely injured man, it was found that at the end of the two or three mile journey in barges out to the boat, even though they were bombed *en route*, the men arrived in fairly good condition, in a much better condition than when a quarter grain of morphine only was given.

Major Row was asked what suggestion he would make regarding the staff. Major Row replied that actually the people who came to the first aid post should be only the slightly wounded, but relatives might get excited and bring seriously wounded persons there contrary to instructions, especially if there should be a large number of seriously injured close to the post. Therefore a first aid post should have a good staff of sound commonsense people to help those in mental distress, also some who could go out and give morphine to those who were in pain and seriously injured, if a doctor were not available from a mobile unit; or the medical officer at the first aid post could visit any such between the waves of bombers and take shelter during the wave. If any reports were received of serious cases they should be marked on a map of the district so that none would be overlooked when an ambulance was available to pick them up.

Major Row felt that calming, comforting and controlling the emotional patient was one of the major things first aid men would have to do; whereas the small cuts and fractures and contusions could be bandaged and left alone for four to six hours, the mental chaos had to be dealt with immediately. Smaller doses of morphine for such cases were very useful (especially if any pain had to be overcome), or two grains of phenobarbital or a large dose of bromide. It was better to put excited and hysterical people in a room by themselves with a few level-headed and sympathetic persons to take charge; for this reason one large room or hall was inadvisable.

The question was asked was it likely that any dead or dying people would be brought to the post. Major Row said that such persons might be brought by friends or relatives until the public learned to know better. Any obviously dying casualties should not be shifted except to a house nearby, where they could be given a dose of morphine and quiet and warmth and rest. Medical men would have to use their authority and sense of responsibility and refuse to let them be taken to hospital or first aid post. Even seasoned troops became excited and a crowd was liable to become quite frantic if they saw bodies lying about. Those badly mutilated, if taken to hospital, wasted too much time for no good purpose, as they would die in any case and should not spoil the chance of others. It would be terrible to lose two or three good lives through wasting time on one already practically lost. It would be found that neighbours were very willing to help one another and they developed wonderful fellow feeling in an air raid.

Major Row was asked whether he considered present preparations adequate. Major Row replied that probably a big raid would cause a lot of trouble, whereas they might cope with a small one. In one raid in Tobruk eighteen German planes killed forty and wounded many more; and whilst the military hospital was ready with about twenty doctors on the spot, that one raid strained their resources to the utmost although they were accustomed to dealing with casualties.

Major Row understood that teams would go out from the ambulance depots and be disposed at certain points about the city. They would include a doctor who would inspect the casualty, give morphine if necessary, render first aid and decide whether the casualty should go to the hospital or first aid post. Leaving some person in charge, that ambulance would then proceed to the next case. These casualties would be picked up and transported to their destination by a second (auxiliary) ambulance car which would follow them up some twenty minutes later (after the morphine given had had time to take effect).

The first aid post was the natural rallying point of the district and probably people would send news there rather than to the wardens, as they should do, as they would consider it the natural point from which they could get help. For this reason the first aid post and ambulance and wardens should be in close collaboration with each other. At the first aid post probably most of the aid required, anyway at first, would be mental rather than surgical, and to assist in giving this, a hot cup of coffee or tea or "Bovril" had a tremendously steadying effect. An effort should be made to get the casualties sitting down and talking, and they would not want to move about with a hot cup of tea in their hands. As Major Row had previously remarked, it would probably be found that the excitement would be intense, and a number of quiet mannered resolute people on the staff would quieten the victims. If these latter saw people doing things in a quiet and orderly way it steadied them marvellously. One officer of a general hospital, when his orderlies got excited on account of bombs falling nearby, quietly lit his pipe and walked across the square in front of them; the effect was immediate and the orderlies felt ashamed.

Major Row thought that good messengers were very necessary as telephone wires might be cut, and some persons would have to act as guides to find wounded people. He would suggest that medical officers did not attempt much surgical work during the arrival and sorting period; there would be too much other work to do and it would probably be better to leave surgical work till the raid was over and then to do it at the local nursing home or quietly at the first aid post.

The question was asked as to the proportion of different casualties occurring in an air raid. Major Row said that that was an important point; there was a good article in THE MEDICAL JOURNAL OF AUSTRALIA of December 28, 1940, which gave some information on this point. Broadly speaking, probably to one person seriously injured there were ten badly shaken; nine out of ten, sometimes ten out of ten, seriously injured persons could go to a hospital that merely had resuscitation methods available, even if it had no operation facilities. Once resuscitated, they could be transported with reasonable safety. In any case resuscitation should always precede operations. Few patients suffered from severe hæmorrhage; if they did, it meant that a large vessel was involved, and this probably would soon end

fatally. Suppose there were fifty casualties at each of fifty centres: of these twenty-five hundred not more than three hundred would need attention at the central hospital; of fifty patients at each post, probably forty would come by themselves and only ten have to be brought (or visited). Major Row thought that any suburban post that received fifty patients from one raid would have bad luck. Big bombs within a quarter of a mile would break all windows and shake anything that was loose off shelves. So they should make sure the bottles at the first aid posts were secure, and he advised them not to make any error; windows would be blown in, not out, with any bomb blast not in a narrow street and close by the windows.

Major Row was asked could he give any more points of interest that would assist the work at a first aid post. He replied that in regard to first aid treatment of burns, the chief point was that the dressing should exclude air, and its application should do no possible damage. Morphine was essential to eliminate pain and reduce shock. Burns of the third degree should never be tanned, for the tanning would not be complete and sepsis would occur under the tanning. In regard to general injuries, if a patient's condition permitted, he should be stripped and examined thoroughly, especially his abdomen. It had to be remembered that all manner of conditions could be treated at nursing homes if necessary; details would be missed at the first aid post and there would be such a rush at the general hospitals that there would be but little time to spare for small details. Doctors should conserve their own energy, and should not be called upon to see every patient at a first aid post just because the patient or his relatives would prefer an expert opinion to comfort them. Every member of the first aid post must be trained to deal with casualties if need be. It would also be helpful if the doctor and other station officers had some distinguishing mark so that they could easily be recognized.

Neighbouring households should be asked to have spare hot water ready to replenish the supply at the post without loss of time, and every household in the district should have two or three blankets clearly marked with their name and address so that they could be returned if they had to be borrowed to wrap up any shocked patients. Major Row advised medical men not to forget that half a grain of ephedrine would give one a fresh supply of energy for several hours if one was feeling tired out. Slit trenches should be dug or adequate shelter should be provided at all first aid posts for staff and patients. A good rule was to rest half of the staff away from the post so that the whole staff could not be obliterated by one bomb; only a minimum number of the staff should stay with those patients who could not get into trenches, the rest should shelter. It was incredible how few people would be hit if they would learn to lie down flat even in an open street. One should always avoid clumping, especially of vehicles, whether prior to or during the collection of casualties. Pedestrians, too, should scatter, not bunch. Major Row instanced the trucks in a military convoy; a steady twenty-five yards or more was maintained between each vehicle when there was any risk of being bombed.

Correspondence.

WARTS.

SIR: As warts, particularly plantar warts, which seem to be more prevalent of late, have always been a trial to all concerned, whatever the method of treatment adopted, I feel sure that a relatively simple and effective method of dealing with them will be of interest. It is, to paint the wart with a 2% solution of brilliant green in *Spiritus Vini Rectificatus* and cover with adhesive plaster. The application is renewed at two or three day intervals and at the end of a week the wart will be found to be somewhat shrunken; the avascular surface is trimmed with scissors, the application continued and the process repeated until the wart is completely removed; in the case of the plantar wart the collar of thickened skin which forms about is also cut away. The time required for total disappearance varies, the more lobulated the wart, the more rapidly it disappears as a rule. Although I have been using this method, which I hit upon accidentally, for only some six months, excellent results have been obtained both in my own practice and at the Queensland Cancer Trust Clinic where many cases are referred for radium or X-ray treatment when recurrence had taken place after surgical removal or caustics had been applied without success. As similar results have not followed the use of *Spiritus Vini Rectificatus* or of some other dyes in spirit solution, it is possible that the action of the brilliant green is a specific one.

Yours, etc.,

97, Wickham Terrace,
Brisbane,
July 24, 1942.

A. J. REYE.

THE RUBBER APPEAL.

SIR: May I make the suggestion that every doctor in Australia should give the rubber floor mats from his or her motor car to the rubber appeal? As a profession we are relatively privileged in the matter of obtaining tires; it should be made a matter of shame for anyone to retain rubber floor mats in a motor car when rubber is so desperately needed.

Yours, etc.,

Bank Chambers,
17, Bolton Street,
Newcastle.
July 27, 1942.

ARTHUR D'OMBRAIN.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 207, of July 30, 1942.

AUSTRALIAN IMPERIAL FORCE.

Australian Army Medical Corps.

Captain C. S. Donald is transferred to a Regimental Supernumerary List, 27th December, 1941.

To be Majors.—Captains (Temporary Majors) R. F. A. Becke, R. J. Humphery, A. M. Macintosh, L. E. Rothstadt, R. H. Macdonald, P. C. Thomas, A. H. Green, R. Warden, W. D. Refshauge, A. C. Mendelsohn and E. P. Cherry, W. M. Irwin, 6th January, 1942; Captain P. A. Tomlinson, Captains (Temporary Majors) C. H. Selby and W. K. Myers, Captain I. F. Vickery and Captain (Temporary Major) A. F. Janes, 6th January, 1942.

To be Majors (temporarily).—Captains R. F. West, R. A. A. Pellew and L. G. Travers, 6th January, 1942.—(Ex. Min. No. 166—Approved 24th July, 1942.)

ROYAL AUSTRALIAN AIR FORCE.

Reserve: Medical Branch.

The following are appointed to commissions on probation with the rank of Flight Lieutenant with effect from the dates shown: Michael James Morrison Black, M.B. (5944), 6th June, 1942; John Grantley Shelton, M.B., B.S. (5945), 26th June, 1942.—(Ex. Min. No. 96—Approved 24th July, 1942.)

CASUALTIES.

ACCORDING to the casualty list received on August 4, 1942, Captain R. A. McDonald, A.A.M.C., Eastwood, New South Wales, Captain M. J. McNamara, A.A.M.C., Mosman, New South Wales, Captain P. T. Millard, A.A.M.C., Lindfield, New South Wales, Captain J. B. Oakeshott, A.A.M.C., Lismore, New South Wales, and Major A. A. Moon, A.A.M.C., Neutral Bay, New South Wales, are reported to be missing abroad.

According to the casualty list received on August 5, 1942, Captain R. D. Puflett, A.A.M.C., Milson's Point, New South Wales, and Captain F. R. Reid, A.A.M.C., Maroubra, New South Wales, are reported to be missing abroad.

According to the casualty list received on August 7, 1942, Captain S. B. Mc. White, A.A.M.C., Neutral Bay, New South Wales, is reported to be missing abroad.

According to the casualty list received on August 10, 1942, Major C. W. Uhr, A.A.M.C., Hamilton, Queensland, and Captain D. C. C. Hinder, A.A.M.C., Gordon, New South Wales, are reported to be missing overseas.

Notice.

THE honorary medical staff of Saint Vincent's Hospital, Melbourne, will hold a clinical meeting at the hospital on Wednesday, August 19, 1942, at 8.15 o'clock p.m. The subject will be "Infections of the Hand" and the principal speaker will be Lieutenant-Colonel W. C. McCally, U.S.A.F.I.A. Members of the Victorian Branch of the British Medical Association are invited to attend.

Obituary.

EDWARD BONAVENTURE HEFFERNAN.

WE regret to announce the death of Dr. Edward Bonaventure Heffernan, which occurred on August 2, 1942, at Heidelberg, Victoria.

MAURICE CHARLES DAVIES.

WE regret to announce the death of Dr. Maurice Charles Davies, which occurred on August 2, 1942, at Avoca, Victoria.

ROBERT USHER RUSSELL.

WE regret to announce the death of Dr. Robert Usher Russell, which occurred on August 3, 1942, at Hamilton, New South Wales.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

MacCulloch, Thomas Harington, M.B., B.S., 1942 (Univ. Sydney), Balmain Hospital, Balmain.

Allen, Trevor, M.B., B.S., 1942 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Pittar, Desmond John, M.B., B.S., 1942 (Univ. Sydney), Wallsend District Hospital, Wallsend.

Richards, Harold Joseph, M.B., B.S., 1941 (Univ. Sydney), NX77286, Captain H. J. Richards, 16 Motor Regiment, Home Forces.

Barder, Kenneth Rothwell, M.B., B.S., 1942 (Univ. Sydney), 53, Darling Point Road, Darling Point.

Medical Appointments.

Dr. John Howard Lidgett Cumpston, C.M.G., a member of the Central Medical Coordination Committee, has been appointed Director-General of the Emergency Civil Medical Practitioners Service in pursuance of regulation 4BA of the National Security (Medical Coordination and Equipment) Regulations.

Dr. John Gladstone Cameron, Dr. John McNaught Scott, Dr. Alexander Hamilton Dottin and Dr. Donald Dunbar Coutts have been appointed Public Vaccinators, Victoria.

Dr. Albert Tange Dunlop has been appointed a member and Chairman of the Board of Optometrical Registration, New South Wales, in pursuance of the provisions of the *Opticians Act*, 1930-1931.

Dr. Stanley Hankin has been appointed Medical Officer of Health for the Municipality of Zeehan, Tasmania, such appointment to take effect on and from June 19, 1942.

Books Received.

"Antenatal and Postnatal Care", by Francis J. Browne, M.D. (Aberdeen), D.Sc., F.R.C.S. (Edinburgh), F.R.C.O.G.; Fourth Edition; 1942. London: J. and A. Churchill Limited. Demy 8vo, pp. 616 with 84 illustrations. Price: 24s. net.

"Lectures to Nurses: A Complete Series of Lectures to Probationary Nurses in their First, Second and Third Years of Training", by Margaret S. Riddell, A.R.R.C., S.R.N.; Eighth Edition; 1942. London: Faber and Faber Limited. Crown 8vo, pp. 630 with 65 illustrations. Price: 7s. 6d. net.

Diary for the Month.

AUG. 18.—New South Wales Branch, B.M.A.: Ethics Committee.
AUG. 19.—Western Australian Branch, B.M.A.: Branch.
AUG. 20.—New South Wales Branch, B.M.A.: Clinical Meeting.
AUG. 25.—New South Wales Branch, B.M.A.: Medical Politics Committee.
AUG. 27.—New South Wales Branch, B.M.A.: Branch.
AUG. 27.—South Australian Branch, B.M.A.: Branch.
AUG. 28.—Queensland Branch, B.M.A.: Council.
AUG. 28.—Tasmanian Branch, B.M.A.: Council.
SEPT. 1.—New South Wales Branch, B.M.A.: Organization and Science Committee.
SEPT. 2.—Western Australian Branch, B.M.A.: Council.
SEPT. 3.—New South Wales Branch, B.M.A.: Special Groups Committee.
SEPT. 3.—South Australian Branch, B.M.A.: Council.
SEPT. 4.—Queensland Branch, B.M.A.: Branch—Jackson Lecture.
SEPT. 8.—Tasmanian Branch, B.M.A.: Branch.
SEPT. 8.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
SEPT. 11.—Queensland Branch, B.M.A.: Council.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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